

WBS	Name	Project Manager	Cost
1	Run Ila	Mike Church	\$3,334,000.00
1.1	Beamlines	Valeri Lebedev	\$120,000.00
1.1.1	A150/P150 beamline	Valerie Lebedev	\$25,000.00

Notes

In Charge:
Lebedev

Potential Impact:

A reduction of the proton emittances in the Tevatron by 10% and antiproton horizontal and vertical emittances by ~40% and 10%, respectively, which will result in an 10% increase in the MI-to-Tevatron (low beta) transfer efficiency for antiprotons, and an increase of 20% in luminosity.

Status:

MI-to-Tevatron (low beta) transfer efficiency for antiprotons is currently 80%. While the efficiency for protons is higher, there is still emittance growth during the transfer.

Notes:

Four sources contribute to the emittance growth:

Currently, transfers from MI to Tevatron make the single largest contribution to the emittance growth. Measurements of the round trip (MI-Tevatron-MI) emittance growth yield factors 1.5 and 1.15 for horizontal and vertical emittances. Reducing the horizontal emittance growth by 40% should yield the beam intensity increase about 10%. That combined with the emittance decrease should increase the luminosity about 20%.

Recent differential orbit measurements proved that the major fraction of the horizontal and vertical emittance growth is driven by the beam envelope mismatch in A1 line, but there are two other optics problems driving the emittance growth:

- (1) the horizontal and vertical dispersion mismatches in A1 and P1 lines
- (2) the *x-y* coupling in the Tevatron.

Additionally two other problems will be addressed:

- (1) jitter in transfer line magnets causes initial betatron oscillations with amplitude up-to 0.5 mm
- (2) jitter and/or incorrect timing in the kickers causes additional emittance growth of ~5 mm-mrad for the first bunch in every four-bunch pbar train.

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1.1.1.1	Perform differential optics measurements in A150 and P150 lines	Valerie Lebedev	\$0.00																																										
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1.1.1.2	Data analysis and upgrade of A150 and P150 lines	Valerie Lebedev	\$0.00																																										
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1.1.1.3	Perform Tevatron optics measurements with turn-by-turn BPMs	Valerie Lebedev	\$0.00																																										
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1.1.1.4	Data analysis of Tevatron optics measurements	Valerie Lebedev	\$0.00																																										
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1.1.1.6	Establish reference differential orbits for beamline diagnostics	Valerie Lebedev	\$0.00																																										
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1.1.1.7	Commission existing BLT (Beam Line Tuner)	Valerie Lebedev	\$0.00																																										
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WBS	Name	Project Manager	Cost
1.1.1.8	Build new BLT and write software	Valerie Lebedev	\$25,000.00

ID	Resource Name	Units	Work	Delay	Start	Finish
34	Annala G.	20%	8.8 days	0 days	Thu 10/31/02	Tue 12/31/02
329	Lorman E.	50%	22 days	0 days	Thu 10/31/02	Tue 12/31/02
467	Scarpine V.	50%	22 days	0 days	Thu 10/31/02	Tue 12/31/02

Notes
Cost: New oscilloscope

1.1.1.9	Commission new BLT	Valerie Lebedev	\$0.00
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1	Tevatron Study Shifts	200%	176.25 days	0 days	Tue 2/11/03	Thu 3/13/03
34	Annala G.	20%	4.4 days	0 days	Wed 2/12/03	Thu 3/13/03
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467	Scarpine V.	20%	4.4 days	0 days	Wed 2/12/03	Thu 3/13/03

Notes
Jeff (10/22/02): Added a link from the end of the shutdown to this task, to prevent it from happening during the shutdown.

1.1.2	AP3/1/P2/P1 8 GeV beamline	Valerie Lebedev	\$95,000.00
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Notes

In Charge:
Lebedev

Potential Impact:
A reduction of the antiproton emittance in the MI by 10%.

Status:
The transfer efficiency for antiprotons from the Accumulator to the MI is currently ~100% but the emittance growth is estimated to be about ~20% (the emittance for the extraction orbit in Accumulator is ~ 5-6 mm mrad, and emittance at 8 GeV in MI is ~7-8 mm mrad).

Notes:
The largest cause of emittance growth is shot-to-shot variation in injection steering. Injection dampers are planned but not yet implemented. This upgrade will also reduce shot setup time.

1.1.2.1	Perform additional rounds of optics measurements	Valerie Lebedev	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	100%	88.13 days	0 days	Sun 12/1/02	Mon 12/30/02
319	Lebedev V.	10%	2.2 days	0 days	Mon 12/2/02	Tue 12/31/02
377	Morgan J.	10%	2.2 days	0 days	Mon 12/2/02	Tue 12/31/02

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1.1.2.2	Measure x-y coupling on Accumulator extraction orbit with quadrupole pickup	Valerie Lebedev	\$0.00																												
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1.1.2.3	Fine tuning of beamline using orthogonal quads	Valerie Lebedev	\$0.00																												
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1.1.2.4	Construct replacement electronics for SEMs	Valerie Lebedev	\$85,000.00																												
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1.1.2.6	Set hysteresis protocol in AP3/AP1 beamlines	Valerie Lebedev	\$0.00																												
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1.1.2.7	Improvements to MI BLT so that 1000 turns of all 4 bunches is collected	Valerie Lebedev	\$0.00																												
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467	Scarpine V.	30%	13.2 days	0 days	Fri 3/14/03	Wed 5/14/03																									
1.1.2.8	Install Hall probes on 2 quadrupoles in AP1 line	Valerie Lebedev	\$10,000.00																												
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Work</th> <th>Delay</th> <th>Start</th> <th>Finish</th> </tr> </thead> <tbody> <tr> <td>377</td> <td>Morgan J.</td> <td>10%</td> <td>6.6 days</td> <td>0 days</td> <td>Tue 10/1/02</td> <td>Tue 12/31/02</td> </tr> <tr> <td>596</td> <td>Schlabach P.</td> <td>25%</td> <td>16.5 days</td> <td>0 days</td> <td>Tue 10/1/02</td> <td>Tue 12/31/02</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	377	Morgan J.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02	596	Schlabach P.	25%	16.5 days	0 days	Tue 10/1/02	Tue 12/31/02									
ID	Resource Name	Units	Work	Delay	Start	Finish																									
377	Morgan J.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02																									
596	Schlabach P.	25%	16.5 days	0 days	Tue 10/1/02	Tue 12/31/02																									

WBS	Name	Project Manager	Cost
1.1.2.9	Make magnet measurements with Hall probes	Valerie Lebedev	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
319	Lebedev V.	10%	2.2 days	0 days	Wed 1/1/03	Thu 1/30/03
377	Morgan J.	10%	2.2 days	0 days	Wed 1/1/03	Thu 1/30/03
596	Schlabach P.	10%	2.2 days	0 days	Wed 1/1/03	Thu 1/30/03

WBS	Name	Project Manager	Cost
1.1.3	120 GeV beamline	Valerie Lebedev	\$0.00

Notes

In Charge:
Lebedev

Potential Impact:
Better focusing on the target should increase stacking rate by ~5-10%

Status:
The optics of the line is in a good state. When target rotation will be fixed we can reduce the proton beam size at the target by about 20 to 30%. Aperture in the final quadrupoles and target overheating will be two major factors limiting further decrease of the beam size

WBS	Name	Project Manager	Cost
1.1.3.1	Perform optics corrections when target rotation is resumed	Valerie Lebedev	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	300%	264.38 days	0 days	Sun 6/1/03	Mon 6/30/03
319	Lebedev V.	20%	4.4 days	0 days	Mon 6/2/03	Tue 7/1/03
377	Morgan J.	15%	3.3 days	0 days	Mon 6/2/03	Tue 7/1/03

Notes

Jeff (10/22/02): move this priority 2 task later to relieve pressure on pbar shifts - needs target rotation anyway.

WBS	Name	Project Manager	Cost
1.2	Main Injector	Shekhar Mishra	\$1,265,000.00

Notes

In charge
Mishra

WBS	Name	Project Manager	Cost
1.2.1	Reduce longitudinal emittance growth	Dave Wildman	\$100,000.00

Notes

In charge
D. Wildman

Potential Impact
Coalescing is presently tuned to maximize efficiency without regard to the longitudinal emittance of the coalesced bunch. If the desired

WBS	Name	Project Manager	Cost
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"Reduce longitudinal emittance growth" continued

Notes

mode of operation is a 2 eV-sec coalesced bunch in the Tevatron, the MI $h=588$ recapture voltage should be set to produce this bucket area. Then the $h=28$, 2.5 MHz, rotation voltage should be lowered (by a factor of $\approx 588/1113$) to reduce the $\Delta P/P$ spread of the rotated beam to match this new recapture voltage. The coalescing efficiency will initially be lower, but reducing the amplitude of the coupled-bunch oscillations and the longitudinal emittance blow-up of the individual bunches should get us back to $270E9$ per coalesced bunch for Tevetron injection.

Status

Two distinct longitudinal problems have been observed on both the \$29 and \$2B cycles. These are coupled-bunch modes and emittance blow-up of a single bunch. For both cycles, two MIRF cavity modes have been seen to interact with the initial coupled-bunch structure coming out of the Booster. Since both of the excited MIRF cavity modes are already passively damped, there are no residual fields from previous turns left in the cavities. Therefore; this can be viewed as a single pass transient beam loading effect on the HOM's of the RF cavities. With this interpretation, it becomes clear that the only solution to the coupled-bunch problem is a bunch-by-bunch active damper. The large dipole oscillations associated with the coupled-bunch motion creates a large "effective" longitudinal emittance of the bunches which is particularly detrimental to the coalescing process and bunch rotation for pbar production. This effect is now much larger than the emittance blow-up of the separate bunches.

Uncertainties

The exact power required for the high level damper is not known. By observing the excitation of the individual HOM's we know that the maximum voltage generated in each cavity is $\leq 200V$ on a \$29 cycle. Therefore a damper voltage of $200V \times 18$ cavities = 3600V could damp the fully developed oscillations. The proposal is to build a wideband RF system similar to the recycler with a peak voltage of 1500 volts. This should result in either the complete elimination or a substantial reduction of the coupled-bunch motion.

Notes

Using the Booster quad damper as a bunch spreader does not result in a lower single bunch emittance at 150 Gev. What it does accomplish is reducing coupled-bunch motion by lowering the peak bunch current and making the bunches much longer compared to the wavelength of the HOM's being driven in the RF cavities. The obvious penalty for using a bunch spreader on the \$2B cycle is that beam is coming into the MI with a single bunch emittance a factor of two larger than on the \$29 cycle.

The plan of action should be first to reduce the coupled-bunch motion using an active bunch-by-bunch damper and then proceed to investigate the individual bunch emittance growth.

Initial damping tests will be done using either the old "green bomb" longitudinal damper or a modified version of the 7.5 MHz Finemet cavity.

A low-level front end for the bunch-by-bunch damper is presently being built by Bill Foster's group of volunteers from PPD and CDF. A

WBS	Name	Project Manager	Cost
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"Reduce longitudinal emittance growth" continued

Notes

budget code with \$500K should be established for the construction of the high power dampers.

1.2.1.1	Build low level front end for dampers	Dave Wildman	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
565	Wildman D.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02
613	Foster G. W.	30%	19.8 days	0 days	Tue 10/1/02	Tue 12/31/02
621	Ashmanskas W.	25%	16.5 days	0 days	Tue 10/1/02	Tue 12/31/02

Notes

Jeff (10/22/02): dropped Bill Ashmanskas 100% to 25%

1.2.1.2	Conduct initial damping tests	Dave Wildman	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
4	MI Study Shifts	250%	110 days	0 days	Wed 1/1/03	Mon 3/3/03
565	Wildman D.	10%	4.4 days	0 days	Wed 1/1/03	Mon 3/3/03
613	Foster G. W.	20%	8.8 days	0 days	Wed 1/1/03	Mon 3/3/03
621	Ashmanskas W.	20%	8.8 days	0 days	Wed 1/1/03	Mon 3/3/03

1.2.1.3	Build high power damping system	Dave Wildman	\$100,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	Electrical Tech.	100%	132 days	0 days	Fri 11/1/02	Mon 5/5/03
565	Wildman D.	60%	79.2 days	0 days	Fri 11/1/02	Mon 5/5/03
613	Foster G. W.	30%	39.6 days	0 days	Fri 11/1/02	Mon 5/5/03

1.2.1.4	Commission high power system with beam	Dave Wildman	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
4	MI Study Shifts	1,000%	220 days	0 days	Tue 5/6/03	Wed 6/4/03
10	Electrical Tech.	20%	4.4 days	0 days	Tue 5/6/03	Wed 6/4/03
565	Wildman D.	40%	8.8 days	0 days	Tue 5/6/03	Wed 6/4/03
613	Foster G. W.	40%	8.8 days	0 days	Tue 5/6/03	Wed 6/4/03
621	Ashmanskas W.	20%	4.4 days	0 days	Tue 5/6/03	Wed 6/4/03

1.2.2	Develop 53 MHz BLC System	Joe Dey	\$5,000.00
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Notes

In Charge
Joe Dey

Potential Impact

Will improve the coalescing efficiency for pbar at fixed energy. 8 to 10% improvement on the average coalescing efficiency is expected on

WBS	Name	Project Manager	Cost
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"Develop 53 MHz BLC System" continued

Notes

high intensity transfers from Pbar.

Status

Need to optimize digital part of the electronics. New up-convert mixer needs to be implemented to reduce the 53 MHz noise level. Spare modules of down-convert, digital delay and up-convert need to be made.

1.2.2.1	Build new up-convert mixer	Joe Dey	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	Electrical Tech.	10%	4.4 days	0 days	Tue 10/1/02	Fri 11/29/02
140	Dey J.	40%	17.6 days	0 days	Tue 10/1/02	Fri 11/29/02
446	Reid J.	10%	4.4 days	0 days	Tue 10/1/02	Fri 11/29/02

1.2.2.2	Build spare: down-convert, digital delay, up-convert modules	Joe Dey	\$5,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	Electrical Tech.	20%	8.8 days	0 days	Tue 10/1/02	Fri 11/29/02
140	Dey J.	10%	4.4 days	0 days	Tue 10/1/02	Fri 11/29/02

1.2.2.3	Commission BLC with beam	Joe Dey	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
4	MI Study Shifts	500%	110 days	0 days	Mon 12/2/02	Tue 12/31/02
140	Dey J.	10%	2.2 days	0 days	Mon 12/2/02	Tue 12/31/02
292	Kourbanis I.	20%	4.4 days	0 days	Mon 12/2/02	Tue 12/31/02

1.2.3	Further 53 MHz BLC commissioning	Joe Dey	\$50,000.00
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Notes

In charge

Dey

Potential Impact

Will improve the longitudinal emittance up the ramp on all high intensity cycles (\$2B and \$29).

Status

Need to implement time delay system to track frequency sweep up the ramp.

Uncertainties

Depending on the amount of beam loading reduction achieved, a digital comb filter feedback system may be needed to gain further

WBS	Name	Project Manager	Cost
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"Further 53 MHz BLC commissioning" continued

Notes

reduction. A digital comb filter system will require additional time and money.

1.2.3.1	Design and build time delay system	Joe Dey	\$50,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	Electrical Tech.	20%	13.2 days	0 days	Mon 12/2/02	Mon 3/3/03
140	Dey J.	40%	26.4 days	0 days	Mon 12/2/02	Mon 3/3/03
446	Reid J.	15%	9.9 days	0 days	Mon 12/2/02	Mon 3/3/03

1.2.3.2	Commission time delay system	Joe Dey	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
4	MI Study Shifts	500%	220 days	0 days	Tue 3/4/03	Fri 5/2/03
140	Dey J.	20%	8.8 days	0 days	Tue 3/4/03	Fri 5/2/03
292	Kourbanis I.	20%	8.8 days	0 days	Tue 3/4/03	Fri 5/2/03
446	Reid J.	10%	4.4 days	0 days	Tue 3/4/03	Fri 5/2/03

1.2.4	Implement MI Dampers	G. W. Foster	\$210,000.00
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Notes

In charge
G. Foster

Potential Impact

1. Transverse
 - a. Reduce emittance growth from injection steering errors (Pbar and P)
 - b. Reduce any residual emittance growth during ramp
 - c. Permit MI operation at increased Intensity in NUMI era
2. Longitudinal
 - a. Remove coupled-bunch oscillations in beam delivered from Booster
 - b. Prevent growth of coupled-bunch instabilities
 - c. Allow bunch rotation to be effective during stacking cycles
 - d. Increase coalescing efficiency and reduce momentum spread after coalescing

Status

It is being designed and in R&D phase.

WBS	Name	Project Manager	Cost																												
1.2.4.1	Initial FPGA development	G. W. Foster	\$0.00																												
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9	Electrical Engineer	100%	22 days	0 days	Tue 10/1/02	Wed 10/30/02																									
613	Foster G. W.	40%	8.8 days	0 days	Tue 10/1/02	Wed 10/30/02																									
621	Ashmanskas W.	25%	5.5 days	0 days	Tue 10/1/02	Wed 10/30/02																									
	<p><u>Notes</u> Jeff (10/22/02): dropped Ashmanskas r to 25% - from 100% .</p>																														
1.2.4.2	Modify and Test Finemet Cavity	G. W. Foster	\$0.00																												
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613	Foster G. W.	20%	8.8 days	0 days	Thu 10/31/02	Tue 12/31/02																									
1.2.4.3	R&D Studies	G. W. Foster	\$0.00																												
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1.2.4.4	Purchase of power amplifiers	G. W. Foster	\$100,000.00																												
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ID	Resource Name	Units	Work	Delay	Start	Finish																									
565	Wildman D.	20%	2.2 days	0 days	Tue 10/1/02	Tue 10/15/02																									
613	Foster G. W.	10%	1.1 days	0 days	Tue 10/1/02	Tue 10/15/02																									
1.2.4.5	Fabrication of striplines and cavities	G. W. Foster	\$100,000.00																												
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ID	Resource Name	Units	Work	Delay	Start	Finish																									
11	Mechanical Engineer	80%	52.8 days	0 days	Tue 10/1/02	Tue 12/31/02																									
12	Mechanical Tech.	160%	105.6 days	0 days	Tue 10/1/02	Tue 12/31/02																									
613	Foster G. W.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02																									
1.2.4.6	Installation of striplines and cavities	G. W. Foster	\$10,000.00																												
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12	Mechanical Tech.	200%	66 days	0 days	Wed 1/1/03	Fri 2/14/03																									
1.2.4.7	Develop FPGA firmware	G. W. Foster	\$0.00																												
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ID	Resource Name	Units	Work	Delay	Start	Finish																									
9	Electrical Engineer	100%	44 days	0 days	Fri 1/31/03	Wed 4/2/03																									
613	Foster G. W.	20%	8.8 days	0 days	Fri 1/31/03	Wed 4/2/03																									
621	Ashmanskas W.	25%	11 days	0 days	Fri 1/31/03	Wed 4/2/03																									

WBS Name Project Manager Cost

"Develop FPGA firmware" continued

Notes

Jeff (10/22/02): dropped Bill Ashmanskas from 100% to 25%

1.2.4.8 Commission full MI Damper System G. W. Foster \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
4	MI Study Shifts	333%	219.78 days	0 days	Thu 4/3/03	Thu 7/3/03
378	Morris D.	20%	13.2 days	0 days	Thu 4/3/03	Thu 7/3/03
565	Wildman D.	20%	13.2 days	0 days	Thu 4/3/03	Thu 7/3/03
613	Foster G. W.	20%	13.2 days	0 days	Thu 4/3/03	Thu 7/3/03

1.2.5 53/2.5/7.5 MHz BPM's in MI Brajesh Choudhary \$600,000.00

Notes

In charge
Brajesh Choudhary

Potential Impact

We plan to accelerate the antiproton beam in the Main Injector using 2.5(7.5) MHz RF systems. This will eliminate the coalescing process and reduce the longitudinal emittance by about a factor of 2. At present the MI BPMs operate only at 53 MHz and we run blind for all other operation. This project will provide a 2.5 MHz BLT system for the MI.

Status

A 2.5 MHz design is in R&D phase for the Recycler. Once the Recycler project is done we will perform a similar upgrade for the Main Injector.

Uncertainties

The current R&D fails to meet the design specifications.

1.2.5.1 Develop 2.5 MHz BLT System Brajesh Choudhary \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
4	MI Study Shifts	400%	176 days	0 days	Mon 12/2/02	Thu 1/30/03
8	Computer Professional	40%	17.6 days	0 days	Mon 12/2/02	Thu 1/30/03
9	Electrical Engineer	100%	44 days	0 days	Mon 12/2/02	Thu 1/30/03
109	Choudhary B.	40%	17.6 days	0 days	Mon 12/2/02	Thu 1/30/03

Notes

Jeff (10/22/02): linked to the RR BPM system work

WBS	Name	Project Manager	Cost
1.2.5.2	Build 2.5 MHz BPM hardware	Brajesh Choudhary	\$600,000.00

ID	Resource Name	Units	Work	Delay	Start	Finish
9	Electrical Engineer	80%	88 days	0 days	Fri 1/31/03	Thu 7/3/03
10	Electrical Tech.	320%	352 days	0 days	Fri 1/31/03	Thu 7/3/03
109	Choudhary B.	10%	11 days	0 days	Fri 1/31/03	Thu 7/3/03

1.2.5.3	Install and Commission 2.5 MHz BPM hardware	Brajesh Choudhary	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
4	MI Study Shifts	667%	440.22 days	0 days	Fri 7/4/03	Fri 10/3/03
8	Computer Professional	50%	33 days	0 days	Fri 7/4/03	Fri 10/3/03
9	Electrical Engineer	80%	52.8 days	0 days	Fri 7/4/03	Fri 10/3/03
10	Electrical Tech.	160%	105.6 days	0 days	Fri 7/4/03	Fri 10/3/03
109	Choudhary B.	80%	52.8 days	0 days	Fri 7/4/03	Fri 10/3/03

1.2.6	2.5 MHz Acceleration	Chandra Bhat	\$100,000.00
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Notes

In charge
Chandra Bhat

Potential Impact

This will remove the coalescing process for pbar, hence will improve pbar longitudinal emittance and efficiency of beam transfer from MI to Tevatron.

Status

Conceptual design exists. No serious work has happened due to manpower limitations. Needs 2.5 MHz BLT and RPOS feedback loop in MI. Needs LLRF software.

1.2.6.1	Develop LLRF	Chandra Bhat	\$100,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
56	Bhat C.	40%	26.4 days	0 days	Fri 11/1/02	Fri 1/31/03
102	Chase B.	50%	33 days	0 days	Fri 11/1/02	Fri 1/31/03
357	Meisner K.	50%	33 days	0 days	Fri 11/1/02	Fri 1/31/03
468	Schappert W.	50%	33 days	0 days	Fri 11/1/02	Fri 1/31/03

1.2.6.2	Commission LLRF	Chandra Bhat	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
4	MI Study Shifts	667%	440.22 days	0 days	Mon 2/3/03	Mon 5/5/03
56	Bhat C.	80%	52.8 days	0 days	Mon 2/3/03	Mon 5/5/03
102	Chase B.	30%	19.8 days	0 days	Mon 2/3/03	Mon 5/5/03
357	Meisner K.	30%	19.8 days	0 days	Mon 2/3/03	Mon 5/5/03

WBS	Name	Project Manager	Cost
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"Commission LLRF " continued

ID	Resource Name	Units	Work	Delay	Start	Finish
468	Schappert W.	30%	19.8 days	0 days	Mon 2/3/03	Mon 5/5/03

1.2.6.3	Full commissioning with BPM's		\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
4	MI Study Shifts	500%	220 days	0 days	Mon 10/6/03	Thu 12/4/03
56	Bhat C.	50%	22 days	0 days	Mon 10/6/03	Thu 12/4/03
102	Chase B.	10%	4.4 days	0 days	Mon 10/6/03	Thu 12/4/03
357	Meisner K.	10%	4.4 days	0 days	Mon 10/6/03	Thu 12/4/03
468	Schappert W.	10%	4.4 days	0 days	Mon 10/6/03	Thu 12/4/03

1.2.7	Diagnostics Improvements	Dave Capista	\$0.00
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Notes

In charge
Capista

Potential Impact
This will provide a stable data source for the MI operation.

Status
Main Injector has several operational instruments, for example DCCT, Toroid, Flying wire, SBD, RTD720 attached to Resistive Wall Monitor. These instruments are not cross calibrated, does not have reliable or user friendly operation, no or little documentation and semi stable data logging of the instrumentation.

1.2.7.1	Perform Diagnostics Improvements	Dave Capista	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
4	MI Study Shifts	250%	330 days	0 days	Tue 10/1/02	Wed 4/2/03
8	Computer Professional	100%	132 days	0 days	Tue 10/1/02	Wed 4/2/03
9	Electrical Engineer	20%	26.4 days	0 days	Tue 10/1/02	Wed 4/2/03
92	Capista D.	40%	52.8 days	0 days	Tue 10/1/02	Wed 4/2/03

1.2.8	Pbar Tune Meter	Denton Morris	\$100,000.00
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Notes

In charge
Denton Morris

Potential Impact

WBS	Name	Project Manager	Cost
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"Pbar Tune Meter" continued

Notes

This will improve day to day operation of the antiproton acceleration cycle.

Status

At present we do not measure the tune of the antiprotons through the ramp. We rely on setting up the Main Injector using the proton beam. Although this is reliable for the MI magnet quality, a small change in tune is occasionally required to keep the efficiency up.

Notes

VSA and a better interface to it than GPIB. We need help from CD in developing a better interface than GPIB for these devices.

1.2.8.1	Develop pbar tune meter	Denton Morris	\$100,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
4	MI Study Shifts	167%	220.44 days	0 days	Fri 11/1/02	Mon 5/5/03
8	Computer Professional	50%	66 days	0 days	Fri 11/1/02	Mon 5/5/03
9	Electrical Engineer	40%	52.8 days	0 days	Fri 11/1/02	Mon 5/5/03
378	Morris D.	20%	26.4 days	0 days	Fri 11/1/02	Mon 5/5/03

1.2.9	Improvement in MI ramp and closure programs	Bruce Brown	\$0.00
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Notes

In charge
Bruce Brown

Potential Impact

This will reduce the transverse emittance growth for protons.

Status

At present the MI ramp and closure are cycle independent. For example when the injection closes on \$29 cycle, other users of beam on other cycles suffer from small injection oscillation at that time, and hence emittance growth. This has to do with the reset of the MI bus ramp and also the extraction of beam being different from Booster on different cycles.

1.2.9.1	Improve MI ramp and closure programs	Bruce Brown	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
4	MI Study Shifts	333%	219.78 days	0 days	Tue 10/1/02	Tue 12/31/02
75	Brown B.	50%	33 days	0 days	Tue 10/1/02	Tue 12/31/02
577	Wu G.	50%	33 days	0 days	Tue 10/1/02	Tue 12/31/02

WBS	Name	Project Manager	Cost
1.2.10	Automate Tune and Chromaticity Measurement	Guan Wu	\$100,000.00

Notes

In charge
Guan Wu

Potential Impact
Improved reliability of the MI

Status

At present we measure the tune in the Main Injector one step at a time manually. The chromaticity is derived from these data offline. This is a time consuming process and undocumented process.

Notes:

Requires a new pinger in the Main Injector that is capable of pinging beam up to 150 GeV and has one turn pinging capability.

1.2.10.1	Design pinger	Guan Wu	\$0.00			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>
9	Electrical Engineer	80%	52.8 days	0 days	Fri 11/1/02	Fri 1/31/03
11	Mechanical Engineer	80%	52.8 days	0 days	Fri 11/1/02	Fri 1/31/03
577	Wu G.	20%	13.2 days	0 days	Fri 11/1/02	Fri 1/31/03

1.2.10.2	Build Pinger and Write Software	Guan Wu	\$100,000.00			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>
9	Electrical Engineer	80%	105.6 days	0 days	Mon 2/3/03	Tue 8/5/03
10	Electrical Tech.	160%	211.2 days	0 days	Mon 2/3/03	Tue 8/5/03
11	Mechanical Engineer	80%	105.6 days	0 days	Mon 2/3/03	Tue 8/5/03
12	Mechanical Tech.	160%	211.2 days	0 days	Mon 2/3/03	Tue 8/5/03
577	Wu G.	50%	66 days	0 days	Mon 2/3/03	Tue 8/5/03

1.2.10.3	Install pinger	Guan Wu	\$0.00			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>
10	Electrical Tech.	160%	17.6 days	0 days	Wed 8/6/03	Wed 8/20/03
12	Mechanical Tech.	100%	11 days	0 days	Wed 8/6/03	Wed 8/20/03
144	Dillow K.	100%	11 days	0 days	Wed 8/6/03	Wed 8/20/03
577	Wu G.	20%	2.2 days	0 days	Wed 8/6/03	Wed 8/20/03

1.2.10.4	Commission pinger	Guan Wu	\$0.00			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>
4	MI Study Shifts	400%	176 days	0 days	Thu 8/21/03	Tue 10/21/03

WBS	Name	Project Manager	Cost
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"Commission pinger" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
577	Wu G.	50%	22 days	0 days	Thu 8/21/03	Tue 10/21/03

1.3	Pbar Source	Dave McGinnis	\$230,000.00
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1.3.1	Commission shot lattice to stacking lattice ramp	Steve Werkema	\$0.00
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Notes
In Charge
Steve Werkema

Potential Impact

Larger stack sizes by about 15%. Faster return to stacking i.e. more stacking time by about ½ hour (3%)

Status

Ramps (stacking-to-shot lattice ramp and a shot-to-stacking lattice ramp) were completed in July 2002 that converge on the initial core tunes after 6 hysteresis cycles. Have not measured lattice properties on either lattice when the ramps are used. Have not integrated into operations

1.3.1.1	Verify present ramps	Steve Werkema	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	200%	86.25 days	0 days	Tue 10/15/02	Tue 10/29/02
203	Gollwitzer K.	10%	1.1 days	0 days	Tue 10/15/02	Tue 10/29/02
559	Werkema S.	10%	1.1 days	0 days	Tue 10/15/02	Tue 10/29/02

Notes
Correct core tunes, closed orbit, q versus delta_p/p, and RF frequencies if necessary.

Jeff (20/10/02): moved forward one month.

1.3.1.2	Verify tune and B-field convergence	Steve Werkema	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	200%	86.25 days	0 days	Tue 11/5/02	Wed 11/20/02
559	Werkema S.	10%	1.1 days	0 days	Wed 11/6/02	Wed 11/20/02

Notes
Jeff (10/22/02): actually had to fiddle with lags and lengths at the level of a few days to make sense of the pbar shift resource plot in Nov-Jan.

1.3.1.3	Measure stacking and shot lattice properties	Steve Werkema	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	600%	504 days	0 days	Tue 12/3/02	Tue 12/31/02

WBS	Name	Project Manager	Cost
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"Measure stacking and shot lattice properties " continued

ID	Resource Name	Units	Work	Delay	Start	Finish
203	Gollwitzer K.	20%	4 days	0 days	Wed 12/4/02	Tue 12/31/02
354	McGinnis D.	10%	2 days	0 days	Wed 12/4/02	Tue 12/31/02
559	Werkema S.	20%	4 days	0 days	Wed 12/4/02	Tue 12/31/02

Notes

Measure lattice functions (η , D/η , q , q versus Δ_p/p) on the central orbit after 6 hysteresis cycles. Correct and re-parse ramps if necessary.

Jeff (10/22/02): put a 1 month lag into the delay to help level pbar shifts.

1.3.1.4	Write hysteresis and sequencer code	Steve Werkema	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
8	Computer Professional	50%	22 days	0 days	Wed 10/30/02	Mon 12/30/02

1.3.2	Debuncher Momentum Cooling Improvements	Paul Derwent	\$0.00
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Notes

In Charge
Paul Derwent

Potential Impact

Smaller momentum spread delivered to Accumulator, which would permit faster cycle time. Faster cycle time would increase stacking rate at low and high stacks.

Status

New Band 1& 2 filters installed. Band 3 & 4 filters ready. Bad components identified. Initial system characterization completed

Uncertainties

Understanding why beam width does not decrease continually through the cycle.

1.3.2.1	Install Band 3 and 4 filters	Paul Derwent	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	400%	352.5 days	0 days	Fri 11/1/02	Sat 11/30/02
354	McGinnis D.	10%	2.2 days	0 days	Fri 11/1/02	Mon 12/2/02
381	Mueller W.	10%	2.2 days	0 days	Fri 11/1/02	Mon 12/2/02
413	Pasquinelli R.	20%	4.4 days	0 days	Fri 11/1/02	Mon 12/2/02
479	Seifrid P.	10%	2.2 days	0 days	Fri 11/1/02	Mon 12/2/02

WBS	Name	Project Manager	Cost
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"Install Band 3 and 4 filters" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
532	Urban J.	10%	2.2 days	0 days	Fri 11/1/02	Mon 12/2/02

Notes
Replace bad components. Make gain leveling operational.

1.3.2.2	Characterize Debuncher momentum cooling	Paul Derwent	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	400%	724.5 days	0 days	Mon 12/2/02	Sat 2/1/03
137	Derwent P.	25%	10.75 days	0 days	Tue 12/3/02	Thu 1/30/03

Notes
Figure out why momentum spread does not decrease to zero for long cycle times.

1.3.3	Commission Core Momentum-Stacktail Compensation Legs	Paul Derwent	\$0.00
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Notes

Project Leader:
Paul Derwent

Potential Impact
Keep the stacktail stable at high stacks. Stacktail gain could be increased. Faster stacking at large stacks would result.

Status
Compensation legs installed.

Uncertainties:
Effects of Compensation on Stacktail Profile

1.3.3.1	Phase in compensation legs	Paul Derwent	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	500%	440.63 days	0 days	Fri 11/1/02	Sat 11/30/02
137	Derwent P.	10%	2.2 days	0 days	Fri 11/1/02	Mon 12/2/02
354	McGinnis D.	10%	2.2 days	0 days	Fri 11/1/02	Mon 12/2/02
381	Mueller W.	10%	2.2 days	0 days	Fri 11/1/02	Mon 12/2/02
413	Pasquinelli R.	10%	2.2 days	0 days	Fri 11/1/02	Mon 12/2/02
479	Seifrid P.	10%	2.2 days	0 days	Fri 11/1/02	Mon 12/2/02
536	VanderMeulen D.	20%	4.4 days	0 days	Fri 11/1/02	Mon 12/2/02

WBS	Name	Project Manager	Cost
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"Phase in compensation legs" continued

Notes

Jeff (10/22/02): Talked to Dave. Moved this forward to level pbar shifts. And this is in fact the plan.

1.3.3.2	Measure Stacktail BTF	Paul Derwent	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	300%	129.38 days	0 days	Mon 12/2/02	Tue 12/17/02
137	Derwent P.	10%	1.1 days	0 days	Tue 12/3/02	Tue 12/17/02
354	McGinnis D.	10%	1.1 days	0 days	Tue 12/3/02	Tue 12/17/02
413	Pasquinelli R.	5%	0.55 days	0 days	Tue 12/3/02	Tue 12/17/02
536	VanderMeulen D.	10%	1.1 days	0 days	Tue 12/3/02	Tue 12/17/02

Notes

Jeff (10/22/02): Removed a start date constraint on this task. Why was it here?

1.3.3.3	Adjust Simulation	Paul Derwent	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
137	Derwent P.	50%	22 days	0 days	Mon 12/2/02	Thu 1/30/03

1.3.4	Bands 2&3 Transverse Core Cooling Equalizers	Dave McGinnis	\$0.00
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Notes

In Charge
Ding Sun

Potential Impact
Increase in Cooling bandwidth by about 0.6 GHz (20%) Lower emittances by 7%

Status
Circulators installed. First pass design complete.

Uncertainties
Available power of solid state final amps.

1.3.4.1	Finish second pass design	Dave McGinnis	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
288	Koch K.	25%	11 days	0 days	Mon 2/3/03	Thu 4/3/03
515	Sun D.	90%	39.6 days	0 days	Mon 2/3/03	Thu 4/3/03

WBS	Name	Project Manager	Cost
1.3.4.2	Install and commission in the tunnel	Dave McGinnis	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	200%	162 days	0 days	Thu 4/3/03	Wed 4/30/03
354	McGinnis D.	10%	1.9 days	0 days	Fri 4/4/03	Wed 4/30/03
381	Mueller W.	10%	1.9 days	0 days	Fri 4/4/03	Wed 4/30/03
413	Pasquinelli R.	10%	1.9 days	0 days	Fri 4/4/03	Wed 4/30/03
479	Seifrid P.	10%	1.9 days	0 days	Fri 4/4/03	Wed 4/30/03

WBS	Name	Project Manager	Cost
1.3.5	AP1 Bunch by Bunch length monitor	Dave Peterson	\$25,000.00

Notes
In Charge
Dave Peterson

Potential Impact
Measure effective longitudinal emittance provided by MI so we can identify sources of emittance growth in MI. Reduce bunch length on target will permit for a faster stacking cycle time.

Status
Not Started

WBS	Name	Project Manager	Cost
1.3.5.1	Design Hardware	Dave Peterson	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
420	Peterson D.	40%	17.6 days	0 days	Fri 11/1/02	Wed 1/1/03

WBS	Name	Project Manager	Cost
1.3.5.2	Build Hardware	Dave Peterson	\$25,000.00

ID	Resource Name	Units	Work	Delay	Start	Finish
143	Dilday M.	40%	17.6 days	0 days	Fri 11/1/02	Wed 1/1/03
420	Peterson D.	10%	4.4 days	0 days	Fri 11/1/02	Wed 1/1/03

WBS	Name	Project Manager	Cost
1.3.5.3	Write Software	Dave Peterson	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
82	Budlong J.	50%	22 days	0 days	Fri 11/1/02	Wed 1/1/03
420	Peterson D.	10%	4.4 days	0 days	Fri 11/1/02	Wed 1/1/03

WBS	Name	Project Manager	Cost
1.3.5.4	Commission System	Dave Peterson	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	50%	93 days	0 days	Wed 1/1/03	Tue 3/4/03
82	Budlong J.	30%	13.2 days	0 days	Thu 1/2/03	Tue 3/4/03
420	Peterson D.	20%	8.8 days	0 days	Thu 1/2/03	Tue 3/4/03
559	Werkema S.	20%	8.8 days	0 days	Thu 1/2/03	Tue 3/4/03

WBS	Name	Project Manager	Cost																																										
1.3.6	Install Moveable Quad stands into Debuncher	Keith Gollwitzer	\$110,000.00																																										
	<i>Notes</i>																																												
	In Charge Keith Gollwitzer																																												
	Potential Impact Larger Debuncher Aperture would increase stack rate																																												
	Status All quad stands are built. All bellows are at Fermilab.																																												
	Uncertainties Will pbar be given any mech. techs for Jan03 shutdown? Stepper motor control.																																												
1.3.6.1	Develop list of cable pulls	Keith Gollwitzer	\$0.00																																										
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Work</th> <th>Delay</th> <th>Start</th> <th>Finish</th> </tr> </thead> <tbody> <tr> <td>402</td> <td>Oberholtzer R.</td> <td>25%</td> <td>5.5 days</td> <td>0 days</td> <td>Fri 11/1/02</td> <td>Mon 12/2/02</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	402	Oberholtzer R.	25%	5.5 days	0 days	Fri 11/1/02	Mon 12/2/02																														
ID	Resource Name	Units	Work	Delay	Start	Finish																																							
402	Oberholtzer R.	25%	5.5 days	0 days	Fri 11/1/02	Mon 12/2/02																																							
1.3.6.2	Identify resources and schedule for installation	Keith Gollwitzer	\$0.00																																										
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1.3.6.3	Install stands in tunnel	Keith Gollwitzer	\$100,000.00																																										
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ID	Resource Name	Units	Work	Delay	Start	Finish																																							
11	Mechanical Engineer	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03																																							
12	Mechanical Tech.	50%	16.5 days	0 days	Wed 1/1/03	Fri 2/14/03																																							
120	Crabtree P.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03																																							
213	Gusler H.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03																																							
622	Survey Crew	25%	8.25 days	0 days	Wed 1/1/03	Fri 2/14/03																																							
1.3.6.4	Pull Cables	Keith Gollwitzer	\$10,000.00																																										
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ID	Resource Name	Units	Work	Delay	Start	Finish																																							
402	Oberholtzer R.	5%	1.1 days	0 days	Wed 1/1/03	Thu 1/30/03																																							
1.3.6.5	Hook up stepper motor control	Keith Gollwitzer	\$0.00																																										
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ID	Resource Name	Units	Work	Delay	Start	Finish																																							
42	Bair C.	35%	11.55 days	0 days	Wed 1/1/03	Fri 2/14/03																																							
143	Dilday M.	35%	11.55 days	0 days	Wed 1/1/03	Fri 2/14/03																																							
420	Peterson D.	20%	6.6 days	0 days	Wed 1/1/03	Fri 2/14/03																																							

WBS	Name	Project Manager	Cost
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"Hook up stepper motor control" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
572	Wisner B.	35%	11.55 days	0 days	Wed 1/1/03	Fri 2/14/03

1.3.6.6	Commission new quad stands	Keith Gollwitzer	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	400%	352.5 days	0 days	Fri 2/28/03	Sun 3/30/03
203	Gollwitzer K.	60%	13.2 days	0 days	Mon 3/3/03	Tue 4/1/03
420	Peterson D.	10%	2.2 days	0 days	Mon 3/3/03	Tue 4/1/03

1.3.7	Build 1-Q Transverse Damper for Accumulator	Dave Peterson	\$5,000.00
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Notes

In Charge
Dave Peterson

Potential Impact

Reduce ion instabilities, permitting for smaller transverse emittances during shots to the TEV

Status

Not Started.

1.3.7.1	Design Electronics	Dave Peterson	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
420	Peterson D.	50%	22 days	0 days	Thu 5/1/03	Tue 7/1/03

Notes

Jeff (10/20/02): For leveling pbar shifts, moved this back 2 months, after talking to Dave.

1.3.7.2	Build electronics	Dave Peterson	\$5,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
143	Dilday M.	50%	11 days	0 days	Wed 7/2/03	Thu 7/31/03

1.3.7.3	Install and commission electronics and damper system	Dave Peterson	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	500%	435 days	0 days	Thu 7/31/03	Fri 8/29/03
143	Dilday M.	25%	5.25 days	0 days	Fri 8/1/03	Fri 8/29/03
420	Peterson D.	40%	8.4 days	0 days	Fri 8/1/03	Fri 8/29/03
559	Werkema S.	20%	4.2 days	0 days	Fri 8/1/03	Fri 8/29/03

WBS	Name	Project Manager	Cost
1.3.8	Develop Transverse Compensation of the Stacktail	Steve Werkema	\$0.00

Notes
In Charge
Steve Werkema

Potential Impact
Reduce heating of the transverse heating of the core via the stacktail which would permit a faster rep rate at large stacks.

Status
We failed at reducing the 3.2 GHz resonance inside the kicker tanks on our first attempt. Because of 3.2 GHz resonance, we do not have a compensation system working. We reduce heating by centering tanks.

Uncertainties
Removal of the 3.2 GHz resonance

1.3.8.1	Develop a plan to combat 3.2 GHz resonance	Steve Werkema	\$0.00			
ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	233%	631.72 days	0 days	Tue 4/1/03	Mon 6/30/03
354	McGinnis D.	10%	6.5 days	0 days	Tue 4/1/03	Mon 6/30/03
413	Pasquinelli R.	10%	6.5 days	0 days	Tue 4/1/03	Mon 6/30/03
536	VanderMeulen D.	10%	6.5 days	0 days	Tue 4/1/03	Mon 6/30/03
559	Werkema S.	60%	39 days	0 days	Tue 4/1/03	Mon 6/30/03

1.3.8.2	RF engineering	Steve Werkema	\$0.00			
ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	67%	183.66 days	0 days	Mon 6/30/03	Tue 9/30/03
10	Electrical Tech.	80%	52.8 days	0 days	Tue 7/1/03	Tue 9/30/03
354	McGinnis D.	40%	26.4 days	0 days	Tue 7/1/03	Tue 9/30/03
413	Pasquinelli R.	40%	26.4 days	0 days	Tue 7/1/03	Tue 9/30/03

1.3.9	Transverse Debuncher Notch Filters for Bands 1 & 2	Ralph Pasquinelli	\$50,000.00
<u>Notes</u>			
In Charge Ralph Pasquinelli			

Potential Impact
Removal of longitudinal lines would permit for larger transverse cooling gain which would permit faster stacking cycle times.

WBS	Name	Project Manager	Cost
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"Transverse Debuncher Notch Filters for Bands 1 & 2" continued

Notes
Status
Not started

Uncertainties
Bad Mixing at band edges due to phase slope of notch filters

1.3.9.1	Begin procurement of BAWs	Ralph Pasquinelli	\$50,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
130	Cullerton E.	20%	4.4 days	0 days	Tue 10/1/02	Wed 10/30/02

1.3.9.2	Design system	Ralph Pasquinelli	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
130	Cullerton E.	60%	79.2 days	0 days	Fri 11/1/02	Mon 5/5/03

1.3.9.3	Assemble and Fabricate Filters	Ralph Pasquinelli	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
381	Mueller W.	35%	23.1 days	0 days	Tue 5/6/03	Tue 8/5/03

1.3.9.4	Installation	Ralph Pasquinelli	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	500%	440.63 days	0 days	Tue 8/5/03	Thu 9/4/03
381	Mueller W.	20%	4.4 days	0 days	Wed 8/6/03	Thu 9/4/03
413	Pasquinelli R.	10%	2.2 days	0 days	Wed 8/6/03	Thu 9/4/03
479	Seifrid P.	20%	4.4 days	0 days	Wed 8/6/03	Thu 9/4/03

1.3.9.5	Commission and phase the system	Ralph Pasquinelli	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	400%	376.5 days	0 days	Thu 9/4/03	Mon 10/6/03
354	McGinnis D.	20%	4.4 days	0 days	Fri 9/5/03	Mon 10/6/03
413	Pasquinelli R.	20%	4.4 days	0 days	Fri 9/5/03	Mon 10/6/03

1.3.10	Make Flying Wires in Accumulator Operational	Vladimir Nagaslaev	\$0.00
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Notes
In Charge
Vladimir Nagaslaev

Potential Impact

WBS	Name	Project Manager	Cost
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"Make Flying Wires in Accumulator Operational" continued

Notes

Help monitor Accumulator emittances.

Status

Upstairs electronic hardware has been upgraded. Problems with wires in tunnel are being investigated.

1.3.10.1	Upgrade software	Vladimir Nagaslaev	\$0.00			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>
2	Pbar Study Shifts	67%	183.66 days	0 days	Tue 10/1/02	Tue 12/31/02
8	Computer Professional	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
386	Nagaslaev V.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
586	Zagel J.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02

1.3.10.2	Upgrade hardware	Vladimir Nagaslaev	\$0.00			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>
12	Mechanical Tech.	210%	69.3 days	0 days	Wed 1/1/03	Fri 2/14/03
386	Nagaslaev V.	20%	6.6 days	0 days	Wed 1/1/03	Fri 2/14/03
586	Zagel J.	20%	6.6 days	0 days	Wed 1/1/03	Fri 2/14/03

Notes

Open Flying Wire tanks in tunnel during Jan03 shutdown and investigate problems. Bake A40 when finished

1.3.10.3	Recommission flying wires	Vladimir Nagaslaev	\$0.00			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>
2	Pbar Study Shifts	100%	364.13 days	0 days	Wed 5/14/03	Sat 9/13/03
8	Computer Professional	20%	17.6 days	0 days	Thu 5/15/03	Mon 9/15/03
386	Nagaslaev V.	20%	17.6 days	0 days	Thu 5/15/03	Mon 9/15/03
586	Zagel J.	20%	17.6 days	0 days	Thu 5/15/03	Mon 9/15/03

1.3.11	Commission Accumulator Quadrupole Pickup	Vladimir Nagaslaev	\$0.00
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Notes

In Charge

Vladimir Nagaslaev

Potential Impact

Will be used to determine beamline match. Will help make pbar emittances in the Main Injector smaller

Status

WBS	Name	Project Manager	Cost
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"Commission Accumulator Quadrupole Pickup" continued

Notes

Initial data analysis is promising but there are problems with saturation of the tunnel pre-amps.

Uncertainties

Whether the dipole mode can be eliminated from the quadrupole signal.

1.3.11.1	Rebuild tunnel preamps	Vladimir Nagaslaev	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
386	Nagaslaev V.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
420	Peterson D.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02
539	Vargo R.	35%	23.1 days	0 days	Tue 10/1/02	Tue 12/31/02

1.3.11.2	Develop PC front-end DAQ and analysis	Vladimir Nagaslaev	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	0%	0 days	0 days	Tue 12/31/02	Tue 12/31/02
386	Nagaslaev V.	70%	92.4 days	0 days	Wed 1/1/03	Thu 7/3/03

Notes

Jeff (10/22/02): set pbar study shifts to zero <- was at 67%. I think this was an error?

1.3.12	Upgrade Stacktail Notch Filter	Vladimir Nagaslaev	\$40,000.00
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Notes

In Charge
Ed Cullerton

Potential Impact

An improvement of the stacktail notch filters will reduce the load on the 2-4 core momentum system for large stacks and improve stacking performance.

Status

The existing notch filters have a bandwidth from 2 to 4 GHz, while the pickups have a response from 1.8 to 3.6 GHz. There is also a bandpass filter directly after the notch filter with a bandwidth from 2-4 GHz. It is desired to make the bandwidth of the notch filters and bandpass filter to cover the bandwidth of the pickup (1.8-3.6 GHz). Equalizers for the existing Bulk Acoustic Wave delay's (BAW's) have been investigated to make the notch filter have a bandwidth from 1.8 to 3.6 GHz. Implementing equalizers for the existing system has been found to be not practical for the following reasons:

1. The existing BAW's have a significant gain and phase roll off below 2 GHz.
2. The large gain roll off adds a significant amount of insertion loss to the BAW.

WBS	Name	Project Manager	Cost																																																								
"Upgrade Stacktail Notch Filter" continued																																																											
	<u>Notes</u>																																																										
	3. There is only one spare BAW for the system. Having only one spare means that only one equalizer at a time can be designed and tested. A new bandpass filter design has not been started. The existing filter is a FIR type filter implemented with coupled lines. The upgrade filter will most likely be the same type of design.																																																										
1.3.12.1	Procure BAWs	Vladimir Nagaslaev	\$40,000.00																																																								
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1.3.12.2	Design of FIR Bandpass Filter	Vladimir Nagaslaev	\$0.00																																																								
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1.3.12.3	Fabrication and testing of FIR Filters	Vladimir Nagaslaev	\$0.00																																																								
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1.3.12.4	Install and commission new BAWs	Vladimir Nagaslaev	\$0.00																																																								
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413	Pasquinelli R.	10%	2.2 days	0 days	Mon 10/6/03	Tue 11/4/03																																																					
479	Seifrid P.	10%	2.2 days	0 days	Mon 10/6/03	Tue 11/4/03																																																					
1.4	Proton Source	Bob Webber	\$165,000.00																																																								
1.4.1	Investigating Booster Performance Limitations	Ray Tomlin	\$15,000.00																																																								

Notes

Description: We hope to understand in detail what limits the efficiency and maximum intensity of proton acceleration in the Booster. This will hopefully serve to both directly increase the number of protons which can be accelerated per cycle and to reduce the losses in the tunnel, thereby increasing the total number of protons that can be delivered. Areas specifically targeted for investigation include injection and RF capture, space charge effects, transition crossing, and potential transverse instabilities.

Person in Charge: Ray Tomlin

WBS	Name	Project Manager	Cost
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"Investigating Booster Performance Limitations" continued

Notes

Status: Investigations in progress

Uncertainties: None identified, although these areas have been investigated in the past and are still not adequately understood and documented.

1.4.1.1 Injection and Capture Studies Ray Tomlin \$15,000.00

ID	Resource Name	Units	Work	Delay	Start	Finish
5	Booster Study Shifts	200%	132 days	0 days	Tue 10/1/02	Tue 12/31/02
6	Physicist	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
9	Electrical Engineer	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02
10	Electrical Tech.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
529	Tomlin R.	40%	26.4 days	0 days	Tue 10/1/02	Tue 12/31/02

1.4.1.2 Space Charge Effect Studies Ray Tomlin \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
5	Booster Study Shifts	200%	132 days	0 days	Tue 10/1/02	Tue 12/31/02
6	Physicist	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
529	Tomlin R.	40%	26.4 days	0 days	Tue 10/1/02	Tue 12/31/02

1.4.1.3 Transition Crossing Studies Ray Tomlin \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
5	Booster Study Shifts	200%	88 days	0 days	Fri 11/1/02	Wed 1/1/03
6	Physicist	20%	8.8 days	0 days	Fri 11/1/02	Wed 1/1/03
529	Tomlin R.	40%	17.6 days	0 days	Fri 11/1/02	Wed 1/1/03

1.4.1.4 Transverse Damper investigations in Booster Ray Tomlin \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
5	Booster Study Shifts	200%	132 days	0 days	Tue 10/1/02	Tue 12/31/02
6	Physicist	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
529	Tomlin R.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02

1.4.2 Aperture and Orbit Improvements Eric Prebys \$0.00

Notes

Description: Increasing effective Booster aperture, especially early in the acceleration cycle, and optimizing the high-field closed orbit may permit operation with reduced beam loss and correspondingly higher intensity.

Person in charge: Eric Prebys

Status: in progress

Uncertainties: Overall benefit is difficult to predict quantitatively

WBS	Name	Project Manager	Cost																												
1.4.2.1	Commission Ramped Correctors	Eric Prebys	\$0.00																												
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5	Booster Study Shifts	400%	528 days	0 days	Tue 10/1/02	Wed 4/2/03																									
433	Prebys E.	40%	52.8 days	0 days	Tue 10/1/02	Wed 4/2/03																									
1.4.2.2	Magnet Moves	Eric Prebys	\$0.00																												
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1.4.3	Phase Lock Improvements	Bill Pellico	\$5,000.00																												
	<p><u>Notes</u></p> <p><u>Description:</u> Devise and implement hardware changes to Booster low level RF system to allow more “adiabatic” phase lock for Booster to Main Injector transfer. The process of phase locking Booster beam to the Main Injector RF for transfer currently subjects the beam to a significant longitudinal perturbation that may contribute to the final longitudinal emittance of the Booster beam. Reducing this perturbation may result in marginally improved beam longitudinal emittance for Collider filling and antiproton stacking.</p> <p><u>Person in charge:</u> Bill Pellico</p> <p><u>Status:</u> In progress</p> <p><u>Uncertainties:</u> None identified</p>																														
1.4.3.1	Determine specific details and shortcomings of existing hardware implementation	Bill Pellico	\$0.00																												
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ID	Resource Name	Units	Work	Delay	Start	Finish																									
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417	Pellico W.	20%	6.6 days	0 days	Tue 10/1/02	Thu 11/14/02																									
1.4.3.2	Attempt phase lock of beam signal rather than VCO signal to MI RF reference within context of present s	Bill Pellico	\$0.00																												
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417	Pellico W.	10%	1.1 days	0 days	Mon 12/2/02	Mon 12/16/02																									
1.4.3.3	Design and Produce New Implementation	Bill Pellico	\$5,000.00																												
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417	Pellico W.	40%	13.2 days	0 days	Tue 12/17/02	Thu 1/30/03																									
1.4.3.4	Install, and commission new implementation	Bill Pellico	\$0.00																												
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5	Booster Study Shifts	267%	88.11 days	0 days	Fri 1/31/03	Tue 3/18/03																									

WBS	Name	Project Manager	Cost
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"Install, and commission new implementation" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
8	Computer Professional	20%	6.6 days	0 days	Fri 1/31/03	Tue 3/18/03
10	Electrical Tech.	20%	6.6 days	0 days	Fri 1/31/03	Tue 3/18/03
417	Pellico W.	30%	9.9 days	0 days	Fri 1/31/03	Tue 3/18/03

1.4.4	Booster Longitudinal dampers	Bill Pellico	\$25,000.00
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Notes

Description: Longitudinal dampers are required to maintain small longitudinal emittances (<.15 ev-sec/bunch) @ 8 GeV at the Run II required intensities. Improvements in stacking and coalescing may not be evident until the longitudinal emittance blowup in the MI is diagnosed and mitigated. A rebuild of the Booster longitudinal damper low-level electronics is necessary to reduce noise levels, improve system maintainability, and replace components that are no longer available. Documentation needs to be improved to facilitate damper system operation and maintenance.

Person in charge: Bill Pellico

Status: Currently 5 individual longitudinal modes are effectively damped: 3 with un-maintainable hardware and 1 with prototype of new hardware

Uncertainties: None identified

1.4.4.1	Complete and debug design of new system and fabricate circuits	Bill Pellico	\$25,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	Electrical Tech.	50%	30 days	0 days	Tue 10/1/02	Mon 12/23/02
417	Pellico W.	30%	18 days	0 days	Tue 10/1/02	Mon 12/23/02

1.4.4.2	Install and commission new system	Bill Pellico	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
5	Booster Study Shifts	100%	22 days	0 days	Tue 12/24/02	Wed 1/22/03
10	Electrical Tech.	25%	5.5 days	0 days	Tue 12/24/02	Wed 1/22/03
417	Pellico W.	40%	8.8 days	0 days	Tue 12/24/02	Wed 1/22/03

1.4.5	Booster Beam Collimator System	Jim Lackey	\$120,000.00
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Notes

Description: Collimation system in Booster is expected to absorb beam loss radiation load in a location that can be well shielded and that might otherwise have to be carried by RF cavities and other critical beamline devices. This will permit increased proton delivery rate from Booster to the benefit of antiproton stacking and reduced radiation exposure to maintenance workers in Booster tunnel.

Person in charge: Jim Lackey

Status: Collimators and absorbers are installed. Mechanical design, fabrication, and installation of shielding must be completed before exposing the collimators to high radiation doses.

Uncertainties: How to control beam orbit to achieve design collimator performance and how to live with extremely radioactive, ~100R/hr,

WBS	Name	Project Manager	Cost
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"Booster Beam Collimator System" continued

Notes
devices in Booster tunnel

1.4.5.1	Complete shielding design	Jim Lackey	\$5,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
15	Drafter/Designer	75%	24.75 days	0 days	Tue 10/1/02	Thu 11/14/02
106	Chen Z.	80%	26.4 days	0 days	Tue 10/1/02	Thu 11/14/02
304	Lackey J.	10%	3.3 days	0 days	Tue 10/1/02	Thu 11/14/02

1.4.5.2	Procure shielding materials	Jim Lackey	\$25,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
106	Chen Z.	20%	6.6 days	0 days	Fri 11/15/02	Tue 12/31/02
304	Lackey J.	10%	3.3 days	0 days	Fri 11/15/02	Tue 12/31/02

1.4.5.3	Install shielding	Jim Lackey	\$90,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
12	Mechanical Tech.	100%	22 days	0 days	Wed 2/12/03	Thu 3/13/03
38	Augustine D.	25%	5.5 days	0 days	Wed 2/12/03	Thu 3/13/03
106	Chen Z.	40%	8.8 days	0 days	Wed 2/12/03	Thu 3/13/03
304	Lackey J.	20%	4.4 days	0 days	Wed 2/12/03	Thu 3/13/03

1.4.5.4	Commission collimation system with beam	Jim Lackey	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
5	Booster Study Shifts	400%	176 days	0 days	Fri 3/14/03	Wed 5/14/03
106	Chen Z.	10%	4.4 days	0 days	Fri 3/14/03	Wed 5/14/03
304	Lackey J.	30%	13.2 days	0 days	Fri 3/14/03	Wed 5/14/03

1.5	Reliability	Paul Czarapata	\$484,000.00
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Notes
In charge
Czarapata

1.5.1	VFC	Dan Wolff	\$68,000.00
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Notes
In charge
Wolff

Potential Impact

WBS	Name	Project Manager	Cost
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"VFC" continued

Notes

The Voltage to Frequency Converters (VFC's) have been the source of 10 lost stores since the start of Run IIa. The VFC's are used to sense the cell voltage on the superconducting Tevatron magnets to determine if a quench is beginning. The VFC chassis's in use are now nearing 20 years of service. Every VFC failure is sensed as a quench and causes an immediate beam abort.

Status

There are 248 VFC cards in the Tevatron. 44 new cards have been installed since spring and have worked without failure. An additional 81 cards are awaiting the DC/DC converter due in October from the vendor.

Uncertainties

An attempt to directly solder the cables to the cards will be tried to minimize the number of connectors. It is believed that all recent problems have been due to socket or connector problems. All cards functioned after having components removed from the socket and replaced. All of the new cards will have the components soldered directly to the board.

1.5.1.1	Install new VFC cards	Dan Wolff	\$68,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	Electrical Tech.	100%	88 days	0 days	Tue 10/1/02	Thu 1/30/03
573	Wolff D.	5%	4.4 days	0 days	Tue 10/1/02	Thu 1/30/03

1.5.2	Wet Engines	Jay Theilacker	\$0.00
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Notes

In Charge
Theilacker

Potential impact:

Increased luminosity - six stores have been lost in the last year due to wet engine failure.

Status

There are 24 wet engines in the ring. 20 are centrifugal units and 4 are reciprocating units. 4 units have been overhauled on a one-day shutdown.

Uncertainties

Downtime availability - the units will be overhauled as the opportunities arise.

WBS	Name	Project Manager	Cost
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"Wet Engines" continued

Notes

Notes

All components are on hand and Cryogenic Department personnel will perform the work.

1.5.2.1	Overhaul Wet Engines	Jay Theilacker	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
12	Mechanical Tech.	200%	22 days	0 days	Wed 1/1/03	Wed 1/15/03
523	Theilacker J.	50%	5.5 days	0 days	Wed 1/1/03	Wed 1/15/03

1.5.3	Cold Compressor Bearings	Jay Theilacker	\$0.00
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Notes

In Charge
Theilacker

Potential Impact

Loss of Store due to compressor trip.

Status

First failure destroyed rotor and impeller. The rotors and impellers are Japanese made components and have long lead times with no directly interchangeable parts from other vendors.

Notes

Need to order additional bearings to restock the supply of spares.

1.5.3.1	Replace Cold Compressor bearings	Jay Theilacker	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
12	Mechanical Tech.	200%	88 days	0 days	Wed 1/1/03	Mon 3/3/03
523	Theilacker J.	50%	22 days	0 days	Wed 1/1/03	Mon 3/3/03

1.5.4	Compressor Starters	Jay Theilacker	\$0.00
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Notes

In Charge
Theilacker

Potential Impact

Loss of Store due to compressor trip.

WBS	Name	Project Manager	Cost
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"Compressor Starters" continued

Notes

Status

The replacement of the starters has been anticipated and currently 13 of the 36 starters are on order. We will replace all starters on a three year time cycle. Spare parts will be used to ensure proper operation of the existing units.

Notes

The present plan is to replace over a three-year time frame.

1.5.4.1	Replace compressor starters	Jay Theilacker	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
13	Cryo Engineer	5%	13.2 days	0 days	Tue 10/1/02	Fri 10/3/03
14	Cryo Tech.	10%	26.4 days	0 days	Tue 10/1/02	Fri 10/3/03

1.5.5	PEI Water Cooled Transformers	Julius Lentz	\$416,000.00
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Notes

In Charge
Lentz

Potential Impact

Inability to transfer Protons or Pbars to the recycler. Loss of the NuMI or MiniBoone Experiment running time.

Status

Transformer removal for rewinding and replacement has been underway. One of the ten needed has been replaced

Notes

- (1) There are 16 240KW PEI supplies. Only two currently suffer from the leaking transformers. Looking at the age of the transformers and the erosion seen on others, and being proactive, 10 more need to be done.
- (2) Transformers must be rebuilt ahead of time at the vendor, and then swapped out

Uncertainties

Continued operation of supplies without catastrophic failures due to water leaks cannot be reliably predicted. We know the transformers are well past their normal service life and some units have begun to show leakage of the cooling water.

WBS	Name	Project Manager	Cost
1.5.5.1	Rebuild PEI Transformers	Julius Lentz	\$416,000.00

ID	Resource Name	Units	Work	Delay	Start	Finish
9	Electrical Engineer	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02
10	Electrical Tech.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02

1.5.5.2	Replace PEI Transformers	Julius Lentz	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	Electrical Tech.	200%	44 days	0 days	Wed 1/1/03	Thu 1/30/03
323	Lentz J.	30%	6.6 days	0 days	Wed 1/1/03	Thu 1/30/03

1.5.6	Replacement Kicker Ceramic Beam Tube	Chris Jensen	\$0.00
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Notes
In Charge
Jenson

Potential Impact
Down time for replacement of kicker magnet. The problem lies in the availability of the ceramic pipe to develop new magnets. This is only a problem if the ceramic tube is damaged.

Status
Coors was the previous manufacturer of these beam tubes. They have stopped production and no other vendor can supply tubes of the length needed. Work has been in progress to develop an alternate beampipe-using PEEK® (Poly Ether Ether Keatone). This is ongoing development but the early results look promising.

Uncertainties
Will the material meet all requirements for the kicker beam tubes?

1.5.6.1	Develop Replacement Kicker Ceramic Beam Tube	Chris Jensen	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
12	Mechanical Tech.	5%	13.2 days	0 days	Tue 10/1/02	Fri 10/3/03
255	Jensen C.	50%	132 days	0 days	Tue 10/1/02	Fri 10/3/03

1.5.7	CAMAC Power Supply Replacement in Controls	Jim Patrick	\$0.00
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Notes
In Charge
Patrick

WBS	Name	Project Manager	Cost
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"CAMAC Power Supply Replacement in Controls" continued

Notes

Potential Impact
Loss of store.

Status
Approximately 2/3 of the Tevatron CAMAC power supplies have been replaced. One hundred additional supplies are on order to complete the replacement.

Notes
Awaiting delivery of additional supplies

1.5.7.1	Replace CAMAC power supplies	Jim Patrick	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	Electrical Tech.	200%	44 days	0 days	Wed 2/12/03	Thu 3/13/03

1.5.8 Other Vulnerabilities

Notes

In Charge
Czarapata

Potential Impact
A vulnerability study has recently been completed to look at items that could keep the machine down for a period of at least 3 months. This study has identified a number of equipment vulnerabilities.

Status
Study complete. Assessment beginning

Uncertainties
The plan is to assess the most probable failures and prioritize the listed items. Some equipment is very expensive to acquire and a sensible plan of procurement will be required. Availability of some equipment may require re-design or adaptation.

1.5.8.1	Perform Vulnerability Assessment	Paul Czarapata	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
131	Czarapata P.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02

WBS	Name	Project Manager	Cost
1.5.9	Ongoing Assessment of Downtime and Failures	Paul Czarapata	\$0.00

Notes
In Charge
Czarapata

Potential Impact

Ongoing assessment of downtime is required to assess new problems and prioritize effort on reducing known failure rates. Overall increased integrated luminosity will result.

Status
Ongoing

1.5.9.1	Perform ongoing assessment of downtime and failures	Paul Czarapata	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
123	Crawford J. L.	80%	208 days	0 days	Tue 10/1/02	Mon 9/29/03
131	Czarapata P.	20%	52 days	0 days	Tue 10/1/02	Mon 9/29/03

1.6	SDA	Jean Slaughter	\$0.00
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Notes
In Charge:
J. Slaughter

Potential Impact:

In the narrow sense SDA stands for the system of store-based data acquisition in the SYBASE database and the set of tools for retrieving that information. In a broader sense SDA means Shot Data Analysis and refers to the process of using all available information to understand and compare shots. This includes SDA data, the time-based lumberjack databases, information from logbooks, various spreadsheets, etc.

Dedicated machine studies are very important and are not always well supported by either the SDA database storage, which is exclusively store oriented, or the lumberjack system, which is totally time orientated and poorly archived. Two miscellaneous projects address this issue.

Much of the work does not follow a simple “waterfall” model but is iterative. Useful analysis can begin before all inputs have been validated, and, in fact, serves as feedback to understanding the inputs. Methods will evolve with experience, and needs will change as we better understand the behavior of the accelerator complex.

WBS	Name	Project Manager	Cost
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"SDA" continued

Notes

Status:
Ongoing

1.6.1	Inputs to SDA and SDA Editor	Mike Church	\$0.00
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Notes

In-charge
Church

Potential Impact:

Conclusions drawn from SDA data are only as good as the inputs.

- (1) The instrumentation must be working. (
- (2) The information must be collected at the appropriate time.
- (3) The list of input devices needs to be complete.
- (4) The data needs to be routinely validated.

Status:

- (1) The list of SDA inputs and their timing are currently under a systematic review.
- (2) Problems with instrumentation and a data latency problem in the DAEs were identified, and work with the relevant groups to find and fix the problems is underway. (See item on "DAE Engines".)
- (3) SDAEdit, the tool for specifying what devices are collected during a store and when they are collected, is finished, but will need maintenance.

Uncertainties:

There is a complicated path for information flow from front end to database to application. Problems can be anywhere along the chain and new problems can arise.

1.6.1.1	Review inputs and timing	Mike Church	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
34	Annala G.	10%	6.6 days	0 days	Fri 11/1/02	Fri 1/31/03
110	Church M.	10%	6.6 days	0 days	Fri 11/1/02	Fri 1/31/03
218	Harms E.	10%	6.6 days	0 days	Fri 11/1/02	Fri 1/31/03

WBS	Name	Project Manager	Cost																												
1.6.2	Data acquisition - DAE engines and SYBASE Database	Kevin Cahill	\$0.00																												
	<u>Notes</u>																														
	In charge Cahill																														
	Potential Gain Improve system performance and robustness.																														
	Status The DAE engines are responsible for acquiring data from the front ends and storing it in the SYBASE database. Problems here cause wrong or missing data. (1) The system of data acquisition and storage in the database is complete and operational. However, there has been a serious data latency problem. Recent work has improved the situation considerably, but studies are still underway to characterize data acquisition and operating system behavior and to check if the problems are still occurring at a low rate. (2) Call-in lists and monitoring to detect failures in DAE engines or in the database machines are in place, but some failures do not yet show up as alarms in MCR.																														
	Uncertainties There may be inherent problems that can only be solved by buffering on the instrumentation front ends or changes in the data acquisition architecture. Also more problems may develop as more devices are added to SDA or as accelerator cycle times change.																														
1.6.2.1	Reduce data latency	Kevin Cahill	\$0.00																												
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Work</th> <th>Delay</th> <th>Start</th> <th>Finish</th> </tr> </thead> <tbody> <tr> <td>88</td> <td>Cahill K.</td> <td>10%</td> <td>4.4 days</td> <td>0 days</td> <td>Tue 10/1/02</td> <td>Fri 11/29/02</td> </tr> <tr> <td>602</td> <td>Rechenmacher R.</td> <td>40%</td> <td>17.6 days</td> <td>0 days</td> <td>Tue 10/1/02</td> <td>Fri 11/29/02</td> </tr> <tr> <td>603</td> <td>Kulyavtsev A.</td> <td>40%</td> <td>17.6 days</td> <td>0 days</td> <td>Tue 10/1/02</td> <td>Fri 11/29/02</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	88	Cahill K.	10%	4.4 days	0 days	Tue 10/1/02	Fri 11/29/02	602	Rechenmacher R.	40%	17.6 days	0 days	Tue 10/1/02	Fri 11/29/02	603	Kulyavtsev A.	40%	17.6 days	0 days	Tue 10/1/02	Fri 11/29/02		
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602	Rechenmacher R.	40%	17.6 days	0 days	Tue 10/1/02	Fri 11/29/02																									
603	Kulyavtsev A.	40%	17.6 days	0 days	Tue 10/1/02	Fri 11/29/02																									
1.6.2.2	Improve alarm function	Kevin Cahill	\$0.00																												
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8	Computer Professional	30%	6.6 days	0 days	Mon 12/2/02	Tue 12/31/02																									
1.6.3	Servlet interface and Calibrations	Timofei Bolshakov	\$0.00																												
	<u>Notes</u>																														
	In charge Bolshakov																														

WBS	Name	Project Manager	Cost
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"Servlet interface and Calibrations" continued

Notes

Potential Impact:
Improve speed and robustness.

Status

The tools for analyzing the SDA data all depend on a common infrastructure of servlets and DAEs to communicate with the SYBASE database and apply calibration constants. This system is operational. As usage has increased there have been some problems with speed and robustness. These are being worked on. There is no easy way to take into account calibration changes except by changing the data in the database. These changes appear to be rare.

Uncertainties:

New problems may occur as usage increases. Additional computing resources might be needed.

1.6.3.1	Improve Servlet interface and calibration	Timofei Bolshakov	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
66	Bolshakov T.	50%	67 days	0 days	Tue 10/1/02	Fri 4/4/03

1.6.4	SDA Viewer, PlotViewer, Report Writer	Jean Slaughter	\$0.00
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Notes

In charge
Slaughter

Potential Impact

These are interactive tools for looking at SDA data and extracting it for further analysis. They are very important in understanding stores.

Status

- (1)maintenance and possible new features.
- (2) PlotViewer is used to display snapshot and fast time plot data. It is nominally complete, but has not been exercised much by users.
- (3) The Report Writer allows users to export SDA data in a flexible format using a GUI. It has not yet been evaluated.
- 4) In order for these tools to be useful to machine physicists and other people interested in SDA data, education and documentation are needed. Several tutorials have been held and a rudimentary users guide written.

Uncertainties:

Access speed and robustness may become issues for these tools and the underlying infrastructure as usage increases. As for the Report

WBS	Name	Project Manager	Cost
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"SDA Viewer, PlotViewer, Report Writer" continued

Notes

Writer, it is not yet understood how this will fill users' needs as compared to OSDA and standard tables and plots.

1.6.4.1	Evaluate and document interactive tools	Jean Slaughter	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
66	Bolshakov T.	20%	26.8 days	0 days	Tue 10/1/02	Fri 4/4/03
218	Harms E.	5%	6.7 days	0 days	Tue 10/1/02	Fri 4/4/03
491	Slaughter A.	20%	26.8 days	0 days	Tue 10/1/02	Fri 4/4/03

1.6.5	OSDA interface to SDA and lumberjack data	Paul Lebrun	\$0.00
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Notes

In charge
Lebrun

Potential Impact

Improve access to lumberjack data and options for user's data-analysis tools.

Status

OSDA is a toolkit of java classes that allow users to write their own programs to access SDA data instead of using the limited tools in SDAViewer or Report Writer. It also includes a class to allow access to lumberjack data. It is also the tool for writing standard tables and reports.

- (1) P. Lebrun and S. Panacek in the Computing Division created this package. The infrastructure section is complete, except for access to fast time plots and snapshot data. The detector and physics classes are starting to be developed by Computing Division physicists.
- (2) We are investigating a class for writing ROOT ntuples directly from Java and the JAS analysis environment.

Uncertainties:

For OSDA, access speed and robustness could become issues as usage increases.

1.6.5.1	Add data access from snapshot and fast time plots	Paul Lebrun	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
604	Panacek S.	50%	11 days	0 days	Tue 10/1/02	Wed 10/30/02

1.6.5.2	Develop detector classes for flying wires, synchrotron light and physics class for emittances	Paul Lebrun	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
605	Genser K.	50%	33 days	0 days	Tue 10/1/02	Tue 12/31/02
606	Kuropatkine N.	50%	33 days	0 days	Tue 10/1/02	Tue 12/31/02

WBS	Name	Project Manager	Cost
1.6.5.3	Evaluate ntuple approach and build prototypes	Paul Lebrun	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
6	Physicist	30%	13.2 days	0 days	Tue 10/1/02	Fri 11/29/02

WBS	Name	Project Manager	Cost
1.6.6	Definition of Standard Tables and Plots	Jean Slaughter	\$0.00

Notes

In charge
Slaughter

Potential Impact

Provide standard, quickly accessible data (efficiencies, emittances, intensities) on each store as tables and a simple plotting tool to compare data among stores to help the machine physicists evaluate stores and standardize definitions.

Status

Some tables and plots exist, but need to be revised. A specification document describing the tables and plots exists but needs completing.

Uncertainties

Specifications will change with experience.

WBS	Name	Project Manager	Cost
1.6.6.1	Complete specification document	Jean Slaughter	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
66	Bolshakov T.	30%	26.4 days	0 days	Tue 10/1/02	Thu 1/30/03
491	Slaughter A.	20%	17.6 days	0 days	Tue 10/1/02	Thu 1/30/03
604	Panacek S.	50%	44 days	0 days	Tue 10/1/02	Thu 1/30/03

WBS	Name	Project Manager	Cost
1.6.7	Store checker	Jean Slaughter	\$0.00

Notes

In charge
Slaughter

Potential Impact

Develop its use over next few months and integrate into normal operations.

Status

The Store Checker is a program that runs automatically on every store and compares device values to upper and lower limits, and to other devices, and device times. Failures are posted to a WWW page for a master set of criteria and emailed to subscribers in the case of private

WBS	Name	Project Manager	Cost
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"Store checker" continued

Notes

criteria lists. At present it used to catch timing and device failures and indications of accelerator performance degradation or improvement. The code and infrastructure are essentially finished. A standard file of intensity devices is checked every store.

Uncertainties

The amount of time needed for reviewing the results of every store is not known.

1.6.7.1	Develop Store Checker	Jean Slaughter	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
110	Church M.	10%	8.8 days	0 days	Tue 10/1/02	Thu 1/30/03
491	Slaughter A.	10%	8.8 days	0 days	Tue 10/1/02	Thu 1/30/03
604	Panacek S.	10%	8.8 days	0 days	Tue 10/1/02	Thu 1/30/03

1.6.7.2	Ongoing review of Store Checker results	Jean Slaughter	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
6	Physicist	30%	49.5 days	0 days	Wed 2/12/03	Tue 9/30/03

1.6.8	Shot Analysis -- Instrumentation	Jean Slaughter/Paul	\$0.00
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Notes

In charge
Slaughter/Lebrun

Potential Impact

In conjunction with S. Pordes, the Instrumentation Department and the machine departments, list the devices and their current status, including who is responsible for assessing the quality of the information. Based on this list, find people to cover the blanks.

Status

Many problems are being found naturally as people use SDA. For example, people have found that the synchrotron light system and the flying wires in the Tevatron give different results for emittance. There have been some studies by CDF and D0 volunteers to look at the internal consistency of various devices. It will be much easier to check the instrumentation once the problems with SDA data collection have been solved. The relative calibrations between different devices and the accuracy of the devices have to be known. Also, changes in calibration and times when fixes were made need to be made available to the analyses. The interface to instrumentation needs to be improved with a central list of problems, who's working on them, the relative priority and a time scale. Each instrument needs a person in charge who studies and certifies the physics outputs of that device. The machine departments need people to watch over the instrumentation.

WBS	Name	Project Manager	Cost																					
"Shot Analysis -- Instrumentation" continued																								
	<u>Notes</u>																							
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1.6.8.1	Organization of effort	Jean Slaughter/Paul L	\$0.00																					
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ID	Resource Name	Units	Work	Delay	Start	Finish																		
432	Pordes S.	10%	2.2 days	0 days	Tue 10/1/02	Wed 10/30/02																		
491	Slaughter A.	20%	4.4 days	0 days	Tue 10/1/02	Wed 10/30/02																		
1.6.9	Shot Analysis - Accelerator Complex	Mike Syphers	\$0.00																					
	<u>Notes</u>																							
	In charge Syphers																							
	Potential Impact																							
	A better understanding of the performance over the whole accelerator complex leading to improved tuning and luminosity.																							
	Status																							
	Planning and prototyping: There is a great deal of information collected on each shot: SDA data, logbook information, lumberjack data, etc. There is a serious problem in correlating and understanding that information. One approach is to have as much of the information as possible collected and organized in a standard way and then use that information to develop focused analysis projects as well as recommendations for beam studies and operational changes.																							
1.6.9.1	Standardize and automate the shots log	Mike Syphers	\$0.00																					
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Work</th> <th>Delay</th> <th>Start</th> <th>Finish</th> </tr> </thead> <tbody> <tr> <td>8</td> <td>Computer Professional</td> <td>30%</td> <td>13.2 days</td> <td>0 days</td> <td>Fri 11/1/02</td> <td>Wed 1/1/03</td> </tr> <tr> <td>218</td> <td>Harms E.</td> <td>10%</td> <td>4.4 days</td> <td>0 days</td> <td>Fri 11/1/02</td> <td>Wed 1/1/03</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	8	Computer Professional	30%	13.2 days	0 days	Fri 11/1/02	Wed 1/1/03	218	Harms E.	10%	4.4 days	0 days	Fri 11/1/02	Wed 1/1/03		
ID	Resource Name	Units	Work	Delay	Start	Finish																		
8	Computer Professional	30%	13.2 days	0 days	Fri 11/1/02	Wed 1/1/03																		
218	Harms E.	10%	4.4 days	0 days	Fri 11/1/02	Wed 1/1/03																		
1.6.9.2	Automate numerical part of Mike Church's summary spreadsheet and the TEV spreadsheet	Mike Syphers	\$0.00																					
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Work</th> <th>Delay</th> <th>Start</th> <th>Finish</th> </tr> </thead> <tbody> <tr> <td>8</td> <td>Computer Professional</td> <td>30%</td> <td>6.6 days</td> <td>0 days</td> <td>Mon 12/2/02</td> <td>Tue 12/31/02</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	8	Computer Professional	30%	6.6 days	0 days	Mon 12/2/02	Tue 12/31/02									
ID	Resource Name	Units	Work	Delay	Start	Finish																		
8	Computer Professional	30%	6.6 days	0 days	Mon 12/2/02	Tue 12/31/02																		
1.6.9.3	Followup	Mike Syphers	\$0.00																					
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ID	Resource Name	Units	Work	Delay	Start	Finish																		
110	Church M.	10%	19.6 days	0 days	Mon 2/3/03	Mon 11/3/03																		

WBS	Name	Project Manager	Cost
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"Followup" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
491	Slaughter A.	20%	39.2 days	0 days	Mon 2/3/03	Mon 11/3/03

1.6.10	Longterm storage for lumberjack data	Paul Lebrun	\$0.00
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Notes

In charge
Lebrun

Potential Impact

Develop a plan for a use of ENSTORE as a centralized data repository to improve reliability of SDA data retrieval.

Status

Conceptual studies: Lumberjack data is saved by time stamp (non-triggered) as opposed to SDA data, which is saved by time relative to a step in the store (triggered.). The lumberjack data is saved in a myriad of databases with widely varying frequencies (once per second, per minute, per 15 minute period, etc.) in circular buffers that are overwritten as they fill up. There is no central organization and only the data taken every 15 minutes is permanently archived. Most data disappears after a few days. Therefore studies must often be redone because either a recoverable problem was found in the instrumentation, i.e. recalibration) or additional information which has now been lost needs to be analyzed to understand the study.

Uncertainties

Overload of front-end systems and data retrieval infrastructure.

1.6.10.1	Develop long term data storage	Paul Lebrun	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
8	Computer Professional	100%	88 days	0 days	Tue 10/1/02	Thu 1/30/03
607	Lebrun P.	20%	17.6 days	0 days	Tue 10/1/02	Thu 1/30/03

1.6.11	Data Acquisition Application for Dedicated Studies	Valerie Lebedev/Will	\$0.00
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Notes

In Charge
Lebedev/Piccoli

Potential Impact

Evaluate the prototype and implement an improved method for setting and recording parameter values to improve user efficiency.

WBS	Name	Project Manager	Cost
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"Data Acquisition Application for Dedicated Studies" continued

Notes

Status

Many studies involve systematically changing a parameter such as a magnet current and then recording the parameter setting and data from several devices such as BPMs. The present method using parameter pages and logbooks is time consuming. A general application to automatic the procedure is being developed. The specifications have been set and a prototype is almost finished.

Uncertainties

Overlap with other modes of operation. Overlap with other tools.

1.6.11.1	Write data application program	Valerie Lebedev/Willie	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
319	Lebedev V.	5%	3.3 days	0 days	Tue 10/1/02	Tue 12/31/02
608	Piccoli L.	80%	52.8 days	0 days	Tue 10/1/02	Tue 12/31/02

1.7	Tevatron	Vladimir Shiltsev	\$540,000.00
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1.7.1	Commission transverse dampers	Jim Steimel	\$0.00
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Notes

In Charge

Jim Steimel

Potential Impact

The proton intensities are currently limited to ~180E9/bunch due to transverse instabilities. Effective bunch by bunch transverse dampers will allow this to be increased. In addition, transverse dampers should permit chromaticities to be lowered, which will improve beam efficiencies and lifetimes in the Tevatron.

Status

Horizontal damper signal processing hardware has been constructed. The horizontal damper has been installed and tested. The gain of the system must be optimized for best damping with acceptable emittance growth due to noise. Vertical damper signal processing hardware is 90% complete.

Uncertainties

Dampers will not be effective against some head-tail modes. Commissioning may take longer than anticipated due to unforeseen hardware problems. Noise floor may be too high for reasonable damping without considerable emittance growth. Beam-beam effect from increased proton intensity may prevent luminosity from increasing as proton intensity is increased.

WBS	Name	Project Manager	Cost
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1.7.1.1	Commission horizontal dampers	Jim Steimel	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	300%	273.38 days	0 days	Tue 10/1/02	Thu 10/31/02
288	Koch K.	40%	9.2 days	0 days	Tue 10/1/02	Thu 10/31/02
346	McCormack J.	40%	9.2 days	0 days	Tue 10/1/02	Thu 10/31/02
354	McGinnis D.	10%	2.3 days	0 days	Tue 10/1/02	Thu 10/31/02
506	Steimel J.	80%	18.4 days	0 days	Tue 10/1/02	Thu 10/31/02
519	Tan C.	80%	18.4 days	0 days	Tue 10/1/02	Thu 10/31/02

1.7.1.2	Construct vertical dampers	Jim Steimel	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	300%	240.75 days	4.88 days	Sat 11/2/02	Fri 11/29/02
288	Koch K.	100%	21 days	0 days	Fri 11/1/02	Fri 11/29/02
346	McCormack J.	100%	21 days	0 days	Fri 11/1/02	Fri 11/29/02
354	McGinnis D.	10%	2.1 days	0 days	Fri 11/1/02	Fri 11/29/02
506	Steimel J.	80%	16.8 days	0 days	Fri 11/1/02	Fri 11/29/02
519	Tan C.	20%	4.2 days	0 days	Fri 11/1/02	Fri 11/29/02

1.7.1.3	Commission vertical dampers	Jim Steimel	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	300%	264.38 days	0 days	Sun 12/1/02	Mon 12/30/02
288	Koch K.	40%	8.4 days	0 days	Mon 12/2/02	Mon 12/30/02
346	McCormack J.	40%	8.4 days	0 days	Mon 12/2/02	Mon 12/30/02
354	McGinnis D.	10%	2.1 days	0 days	Mon 12/2/02	Mon 12/30/02
506	Steimel J.	80%	16.8 days	0 days	Mon 12/2/02	Mon 12/30/02
519	Tan C.	60%	12.6 days	0 days	Mon 12/2/02	Mon 12/30/02

1.7.2	Injection dampers	J. Steimel	\$200,000.00
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Notes

In Charge
Jim Steimel

Potential Impact

Due to shot-to-shot variations, bunch-to-bunch variations, and finite signal/noise on the BLT system, there will still be some injection oscillations after closure. These must be damped out with an injection damper for both protons and pbars. Overall gain is the reduction of proton and pbar emittance blowup at injection by 1-2 π -mm-mrad which will result in a 5-10% increase in luminosity.

Status

The system is designed and purchase requisition for the parts is submitted.

WBS	Name	Project Manager	Cost																																																
1.7.2.1	Purchase power amplifiers	J. Steimel	\$200,000.00																																																
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506	Steimel J.	10%	0.1 days	0 days	Tue 10/1/02	Tue 10/1/02																																													
1.7.2.2	Install power amplifiers	J. Steimel	\$0.00																																																
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288	Koch K.	80%	16 days	0 days	Wed 3/5/03	Tue 4/1/03																																													
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519	Tan C.	40%	8 days	0 days	Wed 3/5/03	Tue 4/1/03																																													
1.7.2.3	Commission system	J. Steimel	\$0.00																																																
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Work</th> <th>Delay</th> <th>Start</th> <th>Finish</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Tevatron Study Shifts</td> <td>200%</td> <td>176.25 days</td> <td>0 days</td> <td>Tue 4/1/03</td> <td>Thu 5/1/03</td> </tr> <tr> <td>288</td> <td>Koch K.</td> <td>40%</td> <td>16.4 days</td> <td>0 days</td> <td>Wed 4/2/03</td> <td>Wed 5/28/03</td> </tr> <tr> <td>319</td> <td>Lebedev V.</td> <td>10%</td> <td>4.1 days</td> <td>0 days</td> <td>Wed 4/2/03</td> <td>Wed 5/28/03</td> </tr> <tr> <td>346</td> <td>McCormack J.</td> <td>40%</td> <td>16.4 days</td> <td>0 days</td> <td>Wed 4/2/03</td> <td>Wed 5/28/03</td> </tr> <tr> <td>506</td> <td>Steimel J.</td> <td>30%</td> <td>12.3 days</td> <td>0 days</td> <td>Wed 4/2/03</td> <td>Wed 5/28/03</td> </tr> <tr> <td>519</td> <td>Tan C.</td> <td>30%</td> <td>12.3 days</td> <td>0 days</td> <td>Wed 4/2/03</td> <td>Wed 5/28/03</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	1	Tevatron Study Shifts	200%	176.25 days	0 days	Tue 4/1/03	Thu 5/1/03	288	Koch K.	40%	16.4 days	0 days	Wed 4/2/03	Wed 5/28/03	319	Lebedev V.	10%	4.1 days	0 days	Wed 4/2/03	Wed 5/28/03	346	McCormack J.	40%	16.4 days	0 days	Wed 4/2/03	Wed 5/28/03	506	Steimel J.	30%	12.3 days	0 days	Wed 4/2/03	Wed 5/28/03	519	Tan C.	30%	12.3 days	0 days	Wed 4/2/03	Wed 5/28/03	
ID	Resource Name	Units	Work	Delay	Start	Finish																																													
1	Tevatron Study Shifts	200%	176.25 days	0 days	Tue 4/1/03	Thu 5/1/03																																													
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319	Lebedev V.	10%	4.1 days	0 days	Wed 4/2/03	Wed 5/28/03																																													
346	McCormack J.	40%	16.4 days	0 days	Wed 4/2/03	Wed 5/28/03																																													
506	Steimel J.	30%	12.3 days	0 days	Wed 4/2/03	Wed 5/28/03																																													
519	Tan C.	30%	12.3 days	0 days	Wed 4/2/03	Wed 5/28/03																																													
1.7.3	C0 Lambertson replacement	Peter Garbincius	\$170,000.00																																																

Notes

Project Leader:
Peter Garbincius

Potential Impact

Will allow helix to be opened ~20-30% at 150 GeV by increasing vertical beam aperture at this location. Expect lifetime to get better for both beams. Increase of the horizontal helix now is not possible because of the need for additional separators around C0.

Status

Corresponding beam studies have been performed and the aperture affect quantified; the replacement project is in planning stage.

Uncertainties:

Actual date of shutdown - need to schedule rental of 30 Ton capacity forklift for moving FMI dipoles and hiring and training/qualifying contract manpower.

Length of shutdown - if 6 weeks, do it with large amount of contract labor, if much less than 6 weeks, will have to use large numbers of Fermilab staff 24/7

Date of availability of shunt supply/controls - will not be ready before 1 Nov, easy for 1 Dec.

WBS	Name	Project Manager	Cost
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"C0 Lambertson replacement" continued

Notes

Is new cable tray needed for shunt cable installation in Tevatron tunnel?
Uncertainty if this has to be started without warning e.g. if Tevatron or experiment(s) break

Notes:

<u>Costs:</u>	FY03 costs	FY02 costs
Shunt/controllers		_____ (pretty much already obligated)
Shunt cables/installed	\$ 10 K	
Magnet Stands fab		_____ (already obligated)
TD costs for FMI tubes	\$ 2 K	
Misc. Mechanical items	\$ 30 K	(beam pipe, couplers, Cu flags, bus)
Contingency (50% above +)	\$ 21 K	
Rental of 30 Ton fork lift	\$ 5 K	(quotation from vendor)
Contract Manpower	<u>\$ 105 K</u>	(includes contingency)
Total estimate	\$ 173 K	
Purchase FMI from Spares	\$ 313 K	(may be only paper transfer of funds)

Manpower: T&M contractor supervision, BD Mechanical: disconnect 3 Lambertsons and B48 abort kickers, modify/reinstall/hookup/commission power, water, vacuum, and instrumentation systems, PPD Alignment: as-found, layout of shield blocks and magnet stands, positioning of magnets and beam pipes, document final position, BD/EE: develop, install, and commission shunt supply & controls, BD/Tev: commission

1.7.3.1 Construct shunt supply Peter Garbincius \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
10	Electrical Tech.	40%	17.6 days	0 days	Tue 10/1/02	Fri 11/29/02
423	Pfeffer H.	40%	17.6 days	0 days	Tue 10/1/02	Fri 11/29/02

1.7.3.2 Prepare FMI magnets Peter Garbincius \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
12	Mechanical Tech.	20%	8.8 days	0 days	Tue 10/1/02	Fri 11/29/02

1.7.3.3 Mechanical planning and preparation Peter Garbincius \$30,000.00

ID	Resource Name	Units	Work	Delay	Start	Finish
11	Mechanical Engineer	20%	8.8 days	0 days	Tue 10/1/02	Fri 11/29/02
609	May M.	80%	35.2 days	0 days	Tue 10/1/02	Fri 11/29/02

WBS	Name	Project Manager	Cost
1.7.3.4	Remove Lambertsons and install FMI magnets	Peter Garbincius	\$140,000.00

ID	Resource Name	Units	Work	Delay	Start	Finish
12	Mechanical Tech.	300%	99 days	0 days	Wed 1/1/03	Fri 2/14/03
38	Augustine D.	25%	8.25 days	0 days	Wed 1/1/03	Fri 2/14/03
170	Feyereisen P.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03
609	May M.	50%	16.5 days	0 days	Wed 1/1/03	Fri 2/14/03
622	Survey Crew	20%	6.6 days	0 days	Wed 1/1/03	Fri 2/14/03

WBS	Name	Project Manager	Cost
1.7.4	A0 straight section modification	Mike Martens	\$50,000.00

Notes
In Charge
Mike Martens

Potential Impact
Possible helix improvement (A0 straight section modification) may lead to some 15% larger beam-beam separation at 150 GeV and better antiproton lifetime as the result. This could result in an approximately 5-10% luminosity improvement.

Status
Preliminary calculations have suggested that a change in the A0 straight section lattice will result in a larger helical orbit separation between the protons and pbars. These results need to be confirmed and the implications to Tev operations understood in more detail.

Uncertainties: [precise extent of mechanical work \(at this time\)](#)

WBS	Name	Project Manager	Cost
1.7.4.1	Complete optics calculations	Mike Martens	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
264	Johnstone J.	20%	4.4 days	0 days	Tue 10/1/02	Wed 10/30/02
339	Martens M.	50%	11 days	0 days	Tue 10/1/02	Wed 10/30/02
482	Sen T.	20%	4.4 days	0 days	Tue 10/1/02	Wed 10/30/02
579	Xiao A.	100%	22 days	0 days	Tue 10/1/02	Wed 10/30/02

WBS	Name	Project Manager	Cost
1.7.4.2	Plan work in tunnel	Mike Martens	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
11	Mechanical Engineer	80%	52.8 days	0 days	Tue 10/1/02	Tue 12/31/02
13	Cryo Engineer	80%	52.8 days	0 days	Tue 10/1/02	Tue 12/31/02
216	Hanna B.	40%	26.4 days	0 days	Tue 10/1/02	Tue 12/31/02
339	Martens M.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02

WBS	Name	Project Manager	Cost
1.7.4.3	Fabricate parts	Mike Martens	\$50,000.00

ID	Resource Name	Units	Work	Delay	Start	Finish
11	Mechanical Engineer	50%	22 days	0 days	Fri 11/15/02	Wed 1/15/03
12	Mechanical Tech.	200%	88 days	0 days	Fri 11/15/02	Wed 1/15/03
13	Cryo Engineer	50%	22 days	0 days	Fri 11/15/02	Wed 1/15/03
216	Hanna B.	40%	17.6 days	0 days	Fri 11/15/02	Wed 1/15/03
339	Martens M.	20%	8.8 days	0 days	Fri 11/15/02	Wed 1/15/03

Notes
Bellows, beampipe, cold bypasses, etc

Jeff (10/22/02): changed the link from 206 (was FS with no lag), so that the work happens in the shutdown. I think this is more realistic - planning continues while the parts are fab'd. Note that the length of this fab does NOT allow a new TEL bypass. This is for the solution that moves the dipoles at A0. But the shutdown work estimate is for the bypass solution I think.

1.7.4.4	Install new straight section	Mike Martens	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
11	Mechanical Engineer	50%	11 days	0 days	Thu 1/16/03	Fri 2/14/03
12	Mechanical Tech.	1,000%	220 days	0 days	Thu 1/16/03	Fri 2/14/03
13	Cryo Engineer	50%	11 days	0 days	Thu 1/16/03	Fri 2/14/03
38	Augustine D.	25%	5.5 days	0 days	Thu 1/16/03	Fri 2/14/03
216	Hanna B.	50%	11 days	0 days	Thu 1/16/03	Fri 2/14/03
339	Martens M.	20%	4.4 days	0 days	Thu 1/16/03	Fri 2/14/03
622	Survey Crew	30%	6.6 days	0 days	Thu 1/16/03	Fri 2/14/03

1.7.4.5	Commission new lattice	Mike Martens	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	1,500%	556.88 days	4.88 days	Sun 2/16/03	Fri 2/28/03
34	Annala G.	50%	5 days	0 days	Mon 2/17/03	Fri 2/28/03
339	Martens M.	80%	8 days	0 days	Mon 2/17/03	Fri 2/28/03
510	Still D.	50%	5 days	0 days	Mon 2/17/03	Fri 2/28/03

Notes
Jeff (10/22/02): reduced the duration from 12 days to 10 days to prevent the spike in study shifts from overlapping two months.

1.7.5	Orbit Smoothing	Mike Martens	\$0.00
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Notes
In Charge
Mike Martens

Potential Impact

WBS	Name	Project Manager	Cost
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"Orbit Smoothing" continued

Notes

Keeping the orbits fixed in the Tevatron will lead to more reliable Tevatron operations and may result in 10% higher integrated luminosity. Keeping the orbits fixed also results in more stable tunes and coupling values and that reduces the amount of necessary tuning-up and makes beam based experiments more repeatable.

Status

Experience with the Tevatron in Run I has shown that the orbit drifts by about 0.5 mm rms over the period of several days to weeks. The orbit drifts lead to changes in the tunes and coupling of the machine resulting in emittance blowup and beam loss. At the present time, regular orbit smoothing is not regularly performed because of uncertainties in the beam position monitor (BPM) read backs, lack of algorithms to find erroneous BPM data, and lack of training in the use of the orbit smoothing software.

Notes

Understand the details of Tevatron orbit smoothing with the goal of simplifying the orbit smoothing procedures, reducing the amount of time needed to smooth the orbits, and implement a program of regular orbit smoothing. This will require an understanding of the orbit smoothing algorithms and the development of some additional software. Improving the reliability of the BPM system and incorporating the use of BPM diagnostics into daily operations is also a goal of this project.

Improvement in orbit smoothing will be implemented in stages. The first change is to develop and implement an algorithm to handle flaky BPM data. This will allow a broader range of users to perform orbit smoothing. Later developments may include improved graphics and improved smoothing algorithms.

Uncertainties

Response of BPM's to coalesced beam is not yet fully understood

1.7.5.1	Develop new orbit smoothing algorithms	Mike Martens	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
338	Marsh W.	10%	26 days	0 days	Tue 10/1/02	Mon 9/29/03
339	Martens M.	10%	26 days	0 days	Tue 10/1/02	Mon 9/29/03
407	Olson M.	10%	26 days	0 days	Tue 10/1/02	Mon 9/29/03
462	Sabo J.	10%	26 days	0 days	Tue 10/1/02	Mon 9/29/03
597	Fischler M.	40%	104 days	0 days	Tue 10/1/02	Mon 9/29/03
598	Kallenbach J.	40%	104 days	0 days	Tue 10/1/02	Mon 9/29/03

1.7.5.2	Test new orbit smoothing algorithms	Mike Martens	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	75%	66.09 days	0 days	Tue 10/1/02	Wed 10/30/02
338	Marsh W.	10%	26 days	0 days	Tue 10/1/02	Mon 9/29/03

WBS	Name	Project Manager	Cost
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"Test new orbit smoothing algorithms" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
339	Martens M.	20%	52 days	0 days	Tue 10/1/02	Mon 9/29/03
597	Fischler M.	20%	52 days	0 days	Tue 10/1/02	Mon 9/29/03
598	Kallenbach J.	20%	52 days	0 days	Tue 10/1/02	Mon 9/29/03

1.7.6	Beam-beam studies and calculations	Tanaji Sen	\$0.00
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Notes

In Charge
T Sen

Potential Impact

The beam-beam effect is a major limitation on luminosity. Pbar transfer efficiency in the Tevatron is only 81% at current proton intensities and is a function of proton intensities. Understanding the beam-beam effects may help (a) increase pbar lifetime at injection, (b) reduce pbar losses during the ramp, (c) increase the luminosity lifetime and reduce the variation in bunch by bunch lifetime of pbars during collisions.

Status

Considerable work is required to completely understand the effects of beam-beam interactions in the Tevatron. Models at all stages of the Tevatron cycle are under development. At 150 GeV simple predictions based on minimum beam separations do not agree with experiment. The pbar lifetime depends in a complicated way on beam separations, proton intensities and emittances, tunes, coupling and chromaticity. More detailed theoretical and experimental studies are necessary at injection energy and during the ramp. The situation is somewhat better with understanding beam-beam effects at collision energy. However there is scope for improving the luminosity lifetime and reducing the significant variations in pbar bunch by bunch lifetime. Changes in the helix have not yet lead to much improvement. BPD is participating heavily.

Notes

A partial list of studies: explore changes in the injection helix after the physical aperture at C0 is increased by replacing the present Lambertson magnet, changes in the helix during the ramp and at top energy, changes in coupling and working point at top energy. T. Sen, with the help of V. Shiltsev will make a well-defined list of other issues and studies to be performed. Need a post-doctoral scientist (a replacement for M. Xiao) to participate in beam-beam studies. Ideally the Pbar tunemeter should be available in the MCR. Changes in the tune-meter that perturb the pbar emittance less would be helpful. Need to understand when this can be re-implemented. Measurement of pbar intensities during injection and at all coggging stages before the ramp. BPMs which can be gated to record pbar orbits with protons in the machine. Possibility of installing a wire as a means of compensation of the long-range beam-beam in tandem with the electron lens. Lack of study time is a constraint.

WBS	Name	Project Manager	Cost
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"Beam-beam studies and calculations" continued

Notes

Uncertainties

Actions to be taken are determined by the results of beam studies

1.7.6.1	Ongoing beam studies and calculations	Tanaji Sen	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	200%	2,180.25 days	0 days	Tue 10/1/02	Mon 9/29/03
23	Alexahin Y.	80%	208 days	0 days	Tue 10/1/02	Mon 9/29/03
34	Annala G.	10%	26 days	0 days	Tue 10/1/02	Mon 9/29/03
162	Erdelyi B.	80%	208 days	0 days	Tue 10/1/02	Mon 9/29/03
216	Hanna B.	10%	26 days	0 days	Tue 10/1/02	Mon 9/29/03
482	Sen T.	70%	182 days	0 days	Tue 10/1/02	Mon 9/29/03
510	Still D.	10%	26 days	0 days	Tue 10/1/02	Mon 9/29/03
587	Zhang X.	20%	52 days	0 days	Tue 10/1/02	Mon 9/29/03
599	Cai Y.	50%	130 days	0 days	Tue 10/1/02	Mon 9/29/03

1.7.7	Instability studies	Piotr Ivanov	\$0.00
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Notes

In Charge

P Ivanov

Potential Impact

In order to prevent arising transverse instabilities of proton beam, the Tevatron operates with large positive chromaticities that leads to a degradation of the machine performance. Better understanding of driving mechanisms will allow the design of corresponding feedback systems properly, or to make another choice of counter-measures such as involving the Landau damping through the octupole-induced betatron tune spread, or increasing the synchrotron tune spread by incorporation of additional higher harmonic RF-cavity in active or passive mode.

Status

There is no clear understanding of a driving mechanism for transverse coherent oscillations with a consequent partial beam lost but the instability observations have shown that the role of a the head-tail phenomenon in presence of a space charge incoherent tune shift cannot be definitely excluded. Some observation aspects point out that external EM fields might be concerned in the instability growth, and most likely, the Tevatron RF-cavities can be affected by means of the higher order transverse modes or fundamental mode due to a presence of dispersion. Moreover, the transverse coherent beam dynamics should be very sensitive to this influence since the Tevatron lattice has unacceptable large beta- and dispersion functions within the RF-cavities location.

A model of the longitudinal “dancing bunch” phenomenon is developed.

WBS	Name	Project Manager	Cost
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"Instability studies" continued

Notes

Notes

Continue calculations and beam studies for creation of the transverse instability beam model and its experimental verification.

Develop diagnostics to observe head-tail instabilities.

The goal of the studies is a transition to zero (small positive) chromaticity mode of the Tevatron operation.

Uncertainties

Head-tail diagnostics requires definition

1.7.7.1	Beam studies and calculations	Piotr Ivanov	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	200%	2,204.25 days	0 days	Tue 10/1/02	Fri 10/3/03
34	Annala G.	10%	26.4 days	0 days	Tue 10/1/02	Fri 10/3/03
43	Balbekov V.	80%	211.2 days	0 days	Tue 10/1/02	Fri 10/3/03
249	Ivanov P.	80%	211.2 days	0 days	Tue 10/1/02	Fri 10/3/03
481	Semenov A.	80%	211.2 days	0 days	Tue 10/1/02	Fri 10/3/03
510	Still D.	10%	26.4 days	0 days	Tue 10/1/02	Fri 10/3/03

1.7.7.2	Development of head-tail diagnostics	Piotr Ivanov	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
8	Computer Professional	50%	66 days	0 days	Wed 1/1/03	Thu 7/3/03
9	Electrical Engineer	50%	66 days	0 days	Wed 1/1/03	Thu 7/3/03
10	Electrical Tech.	50%	66 days	0 days	Wed 1/1/03	Thu 7/3/03
249	Ivanov P.	30%	39.6 days	0 days	Wed 1/1/03	Thu 7/3/03
467	Scarpine V.	20%	26.4 days	0 days	Wed 1/1/03	Thu 7/3/03

1.7.8	150 GeV tune and coupling drift; b2 unwind	Mike Martens	\$0.00
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Notes

In Charge

Mike Martens

Potential Impact

Improved control of the tunes and coupling at 150 Gev and near the beginning of the Tevatron ramp should translate into more reliable Tevatron operation and make the shot setup process easier. With less tune drifts the feeddown corrections will be more reliable and implementing octupole corrections schemes may become possible. It has been demonstrated that the feeddowns and octupole circuits can be used to improve the lifetime of beam loss at 150 Gev leading to an increase in the luminosity.

WBS	Name	Project Manager	Cost
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"150 GeV tune and coupling drift; b2 unwind" continued

Notes

Status

Preliminary measurements of the tune and coupling drifts have been completed and the results used to determine the needed corrections in a tune drift compensation system. The software (an upgrade to the OAC called TCHROM) and hardware to implement the tune drift compensation has been finished and tested. The implementation of the entire system awaits machine study time for final testing and commissioning. In addition to correcting the tune and coupling drifts work is underway to identify the source of the tune drifts. This has included beam based measurements and well as the start of a series of magnetic field measurements of the Tevatron dipole by MTF. This work is important for understanding the snapback correction at the start of the Tevatron ramp.

Notes

Commission new hardware for time dependent tune and coupling correction. Understand the source of the tune drift by making beam based measurements and performing magnet measurements. As part of this effort the b2 unwind algorithm will also be reviewed to ensure that it is operating properly.

Uncertainties

There is little uncertainty that the tune drift compensations will work. More data may be needed if the correction is to be applied to operating scenarios other than the typical "perform a dry low beta squeeze before every shot setup."

1.7.8.1	Beam studies	Mike Martens	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	133%	365.41 days	0 days	Thu 5/1/03	Thu 7/31/03
227	Hendricks B.	10%	6.6 days	0 days	Thu 5/1/03	Thu 7/31/03
339	Martens M.	10%	6.6 days	0 days	Thu 5/1/03	Thu 7/31/03
600	Bauer P.	10%	6.6 days	0 days	Thu 5/1/03	Thu 7/31/03

Notes

Jeff (10/22/02): priority 3. moved into spring 03 to relieve tev shifts fall 02

1.7.8.2	Perform magnet measurements at MTF	Mike Martens	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
339	Martens M.	10%	13.2 days	0 days	Tue 10/1/02	Wed 4/2/03
600	Bauer P.	80%	105.6 days	0 days	Tue 10/1/02	Wed 4/2/03

1.7.9	TEL	Vladimir Shiltsev	\$50,000.00
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Notes

In Charge

WBS	Name	Project Manager	Cost
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"TEL" continued

Notes

V Shiltsev

Potential Impact

Required to be maintained as operational for DC beam cleaning, potentially can introduce enough non-linear tune spread to stabilize proton beam, potential pbar lifetime improvement at 150 and 980 GeV by compensating bunch-by-bunch tune spread

Status

TEL-1 operational, non-linearities of charge distribution were recently identified as major reason for lifetime deterioration and good lifetime demonstrated with protons.

Uncertainties

Implementation for beam-beam compensation depends on results of beam studies.

1.7.9.1	Beam studies	Vladimir Shiltsev	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	200%	2,204.25 days	0 days	Tue 4/1/03	Fri 4/2/04
59	Bishopberger K.	25%	66 days	0 days	Tue 4/1/03	Fri 4/2/04
303	Kuznetsov G.	100%	264 days	0 days	Tue 4/1/03	Fri 4/2/04
484	Shiltsev V.	20%	52.8 days	0 days	Tue 4/1/03	Fri 4/2/04
587	Zhang X.	50%	132 days	0 days	Tue 4/1/03	Fri 4/2/04

Notes

Jeff (10/22/02): priority 2. moved to spring 03 to reduce tev shifts in fall 02

1.7.9.2	Modify TEL	Vladimir Shiltsev	\$50,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
9	Electrical Engineer	50%	11 days	0 days	Fri 1/31/03	Mon 3/3/03
10	Electrical Tech.	100%	22 days	0 days	Fri 1/31/03	Mon 3/3/03
11	Mechanical Engineer	50%	11 days	0 days	Fri 1/31/03	Mon 3/3/03
12	Mechanical Tech.	100%	22 days	0 days	Fri 1/31/03	Mon 3/3/03
59	Bishopberger K.	100%	22 days	0 days	Fri 1/31/03	Mon 3/3/03
303	Kuznetsov G.	100%	22 days	0 days	Fri 1/31/03	Mon 3/3/03
396	Nobrega L.	20%	4.4 days	0 days	Fri 1/31/03	Mon 3/3/03
427	Plant Derek	100%	22 days	0 days	Fri 1/31/03	Mon 3/3/03
484	Shiltsev V.	10%	2.2 days	0 days	Fri 1/31/03	Mon 3/3/03
486	Sidorov V.	40%	8.8 days	0 days	Fri 1/31/03	Mon 3/3/03
587	Zhang X.	50%	11 days	0 days	Fri 1/31/03	Mon 3/3/03

WBS	Name	Project Manager	Cost
1.7.10	Schottky detector at E17	Ralph Pasquinelli	\$0.00

Notes

In Charge
R Pasquinelli

Potential Impact

The current Schottky detector does not receive adequate support, is old, and is not well understood. The new Schottky detector will replace it and receive RF&I support.

Status

Under fabrication.

1.7.10.1	Construct Schottky detector	Ralph Pasquinelli	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
65	Bollinger D.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
130	Cullerton E.	50%	33 days	0 days	Tue 10/1/02	Tue 12/31/02
381	Mueller W.	50%	33 days	0 days	Tue 10/1/02	Tue 12/31/02
413	Pasquinelli R.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02
479	Seifrid P.	50%	33 days	0 days	Tue 10/1/02	Tue 12/31/02
515	Sun D.	40%	26.4 days	0 days	Tue 10/1/02	Tue 12/31/02
526	Tinsley D.	50%	33 days	0 days	Tue 10/1/02	Tue 12/31/02

1.7.10.2	Install Schottky detector	Ralph Pasquinelli	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
12	Mechanical Tech.	40%	8.8 days	0 days	Wed 1/1/03	Thu 1/30/03
65	Bollinger D.	20%	4.4 days	0 days	Wed 1/1/03	Thu 1/30/03
381	Mueller W.	20%	4.4 days	0 days	Wed 1/1/03	Thu 1/30/03
413	Pasquinelli R.	10%	2.2 days	0 days	Wed 1/1/03	Thu 1/30/03
427	Plant Derek	100%	22 days	0 days	Wed 1/1/03	Thu 1/30/03
479	Seifrid P.	20%	4.4 days	0 days	Wed 1/1/03	Thu 1/30/03
526	Tinsley D.	50%	11 days	0 days	Wed 1/1/03	Thu 1/30/03

1.7.10.3	Commission Schottky detector	Ralph Pasquinelli	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	300%	282.38 days	0 days	Sat 2/1/03	Tue 3/4/03
65	Bollinger D.	20%	4.4 days	0 days	Mon 2/3/03	Tue 3/4/03
413	Pasquinelli R.	10%	2.2 days	0 days	Mon 2/3/03	Tue 3/4/03
506	Steimel J.	30%	6.6 days	0 days	Mon 2/3/03	Tue 3/4/03

WBS	Name	Project Manager	Cost
1.7.11	Tune feedback	CY Tan	\$0.00

Notes
In Charge
C.Y. Tan

Potential Impact
More reliable Tevatron operation resulting in higher integrated luminosity.

Status
This is a project that is currently not being supported for lack of a leader. Cytan will visit BNL to discussed with T. Roser at RHIC possibility of them building a tune feedback system for us.
Need to identify a project leader to get this off the ground. This might be a candidate for non-BD leadership and implementation (P. Schlabach or engineer?).

Uncertainties
Currently the tune spectra look very messy and complicated to be used for stabilization.

1.7.11.1	Develop a plan for tune feedback system	CY Tan	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
354	McGinnis D.	10%	13.2 days	0 days	Tue 10/1/02	Wed 4/2/03
519	Tan C.	10%	13.2 days	0 days	Tue 10/1/02	Wed 4/2/03

1.7.12	Longitudinal dampers	Jim Steimel	\$0.00
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Notes
In Charge
J Steimel

Potential Impact
Control of longitudinal instabilities and emittance growth. When dampers are commissioned on the ramp, smaller longitudinal emittances may result at LB.

Status
Commissioned @ 150 GeV and 980 GeV with very slow damping time. For faster damping time, we need 53 MHz notch filter and need attenuators removed from the stripline pickup. A PLL card is required for operation on the ramp.

WBS	Name	Project Manager	Cost
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"Longitudinal dampers" continued

Notes

Notes

Design and build PLL card and commission on the ramp. As intensity is increased observe if dipole instabilities develop with dampers on. If they do, the gain of the damper system needs to be increased. The 53 MHz notch filter will be constructed, and the attenuators will be removed from the striplines. This activity will occur after transverse dampers are commissioned

Uncertainties

Is the current gain sufficient enough to control dipole instabilities at the higher intensities? Are there higher order modes which cannot be damped by this damper? Are quadrupole modes present?

1.7.12.1	Develop PLL and notch filter	Jim Steimel	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
288	Koch K.	60%	13.2 days	0 days	Wed 1/1/03	Thu 1/30/03
346	McCormack J.	60%	13.2 days	0 days	Wed 1/1/03	Thu 1/30/03
506	Steimel J.	80%	17.6 days	0 days	Wed 1/1/03	Thu 1/30/03
519	Tan C.	40%	8.8 days	0 days	Wed 1/1/03	Thu 1/30/03

1.7.12.2	Commission Longitudinal Damper	Jim Steimel	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	100%	184.13 days	0 days	Sat 2/1/03	Thu 4/3/03
288	Koch K.	20%	8.8 days	0 days	Mon 2/3/03	Thu 4/3/03
346	McCormack J.	20%	8.8 days	0 days	Mon 2/3/03	Thu 4/3/03
506	Steimel J.	40%	17.6 days	0 days	Mon 2/3/03	Thu 4/3/03
519	Tan C.	40%	17.6 days	0 days	Mon 2/3/03	Thu 4/3/03

1.7.13	Synchrotron Light Monitor	Harry Cheung	\$20,000.00
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Notes

In Charge
H Cheung

Potential Impact

Better understanding of Tevatron beam parameters at 980 GeV

Status

Commissioned and operational. Not fully understood.

Uncertainties

WBS	Name	Project Manager	Cost
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"Synchrotron Light Monitor" continued

Notes

The cost of the image intensifiers are a rough estimate. If one wants to upgrade the system then one would need a faster Mac and replace the Nubus hardware with PCI hardware, this a lot of work potentially, both hardware and software and would require significant funds. (Hopefully, this won't be needed or done in FY03.)

1.7.13.1	Complete commissioning	Harry Cheung	\$20,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
329	Lorman E.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02
364	Miller D.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02
432	Pordes S.	15%	9.9 days	0 days	Tue 10/1/02	Tue 12/31/02
610	Cheung H.	50%	33 days	0 days	Tue 10/1/02	Tue 12/31/02

Notes

Include the cost of spare image intensifier. Not the system upgrade.

1.7.14	Orbit motion spectrometer	Xialong Zhang	\$0.00
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Notes

In Charge
XL Zhang

Potential Impact

Provide better understanding of operational conditions by measuring low-frequency orbit oscillations.

Status

The first measurements were a success. Hardware is purchased. Needs time for commissioning.

Uncertainties

It is unclear if this system can be used for monitoring oscillations at the first betatron line.

1.7.14.1	Beam studies	Xialong Zhang	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	200%	356.25 days	0 days	Tue 10/1/02	Fri 11/29/02
587	Zhang X.	40%	17.6 days	0 days	Tue 10/1/02	Fri 11/29/02

1.7.15	Investigation RF noise	Valerie Lebedev	\$0.00
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Notes

In Charge

WBS	Name	Project Manager	Cost
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"Investigation RF noise" continued

Notes

V Lebedev

Potential Impact

Reduction of the DC beam and the CDF background.

Status

Previous studies (2 shifts) gave inconclusive results on what is the source of the DC beam.

1.7.15.1	Beam studies	Valerie Lebedev	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	34%	187.04 days	0 days	Tue 10/1/02	Wed 4/2/03
319	Lebedev V.	10%	13.2 days	0 days	Tue 10/1/02	Wed 4/2/03
446	Reid J.	10%	13.2 days	0 days	Tue 10/1/02	Wed 4/2/03
611	Romanov G.	40%	52.8 days	0 days	Tue 10/1/02	Wed 4/2/03
612	Khabibullin T.	40%	52.8 days	0 days	Tue 10/1/02	Wed 4/2/03

1.7.16	Tevatron vacuum	Bruce Hanna	\$45,000.00
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Notes

In Charge

B Hanna

Potential Impact

Lower CDF/D0 losses; slower emittance growth @ 150 GeV should improve Tevatron transfer efficiency.

Status

Some work has been done during June 2002 shutdown (ferrite replacement in F11 RWM).

Notes

Make careful review of Tevatron vacuum practices: measurements, documentation, instrumentation, software. Recommend mitigation projects for shutdowns with ultimate goal of 2 fold vacuum improvement.

1.7.16.1	Purchase ion pumps	Bruce Hanna	\$45,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
25	Allen D.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02
216	Hanna B.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02

WBS	Name	Project Manager	Cost
1.7.16.2	Install ion pumps	Bruce Hanna	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
8	Computer Professional	10%	3.3 days	0 days	Wed 1/1/03	Fri 2/14/03
10	Electrical Tech.	10%	3.3 days	0 days	Wed 1/1/03	Fri 2/14/03
12	Mechanical Tech.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03
25	Allen D.	10%	3.3 days	0 days	Wed 1/1/03	Fri 2/14/03
216	Hanna B.	40%	13.2 days	0 days	Wed 1/1/03	Fri 2/14/03

WBS	Name	Project Manager	Cost
1.7.17	Study Collimators and Losses	Ron Moore	\$5,000.00

Notes
In Charge
R Moore

Potential Impact
Reduction in CDF/D0 losses. Operational proton removal is needed for luminosity upgrade.

Status
Simulations are producing useful results. Experiments are generally satisfied with current beam halo backgrounds but in a year both proton and pbar intensities will be significantly higher and lifetime is not supposed to improve resulting in higher loss rates. Collimators themselves work fine, so no beam studies are planned, although monitoring of losses/backgrounds occurs on every store. Part of the losses are due to DC beam - that is subject of another project.

Notes
We await forthcoming results from beam simulations; they should provide useful information that may decide future action, e.g. need for improved vacuum or additional collimators. (New collimators would cost \$20K.) CDF will be adding additional shielding around the low-beta quads in their collision hall. A scintillator paddle will be installed near the D49 proton target collimator in order to measure the particle loss rates caused by collimation.
We need better explanations from the experiments on their need for background reduction. Backgrounds affect the experiments in two ways: operationally and physics-related. CDF's occasional drift chamber high-voltage trips caused by elevated or spiky losses is an example of an operational effect; CDF's excess of large missing transverse energy triggers at 0 degrees azimuth is an effect on the physics they are studying. Currently, the experiments seem satisfied with the proton and pbar halo loss rates; the integrated dose rate of their silicon vertex detectors is now dominated by p-pbar collisions. What are the desired halo loss rates they wish to see? A factor of 2 lower? If Tev vacuum can be improved substantially by warming up cold sections, we would need shutdown time to warm up the entire ring - very time-consuming.

Uncertainties

WBS	Name	Project Manager	Cost
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"Study Collimators and Losses" continued

Notes

- 1 Quantitative description of experiments' needs for background reduction.
- 2 Success of the TD personnel involvement in RF phase error investigation.
- 3 Need for improved Tevatron vacuum, and the resources required if needed.
Need for additional collimators, and the resources required if needed.

1.7.17.1 Beam loss simulaions and measurements Ron Moore \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	100%	1,090.13 days	0 days	Tue 10/1/02	Mon 9/29/03
152	Drozhdin A.	50%	130 days	0 days	Tue 10/1/02	Mon 9/29/03
370	Mokhov N.	50%	130 days	0 days	Tue 10/1/02	Mon 9/29/03
374	Moore R. S.	40%	104 days	0 days	Tue 10/1/02	Mon 9/29/03
395	Nicolas L.	100%	260 days	0 days	Tue 10/1/02	Mon 9/29/03
601	Tollestrup A.	50%	130 days	0 days	Tue 10/1/02	Mon 9/29/03

1.7.17.2 Install scintillator at D49 Ron Moore \$5,000.00

ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	100%	88.13 days	0 days	Sun 12/1/02	Mon 12/30/02
374	Moore R. S.	40%	8.8 days	0 days	Mon 12/2/02	Tue 12/31/02

1.7.17.3 FBI investigations Ron Moore \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
601	Tollestrup A.	10%	13.2 days	0 days	Tue 10/1/02	Wed 4/2/03

1.7.18 Improve Diagnostics Stephen Pordes \$0.00

Notes

In Charge
S Pordes

Potential Impact
Improve diagnostics: SBD, FW

Status

All three systems are operational, but require some software upgrades; some minor questions remain. The diagnostics improvement requires an operationally oriented person in the Tevatron department to lead the project.

Notes

WBS	Name	Project Manager	Cost
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"Improve Diagnostics" continued

Notes

Digital scope in the tunnel to be considered for SBD and FBI. Upgrade FW system to faster CPU so that data is not lost when injecting protons.

1.7.18.1	Upgrade FW CPU	Stephen Pordes	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
175	Flora R.	50%	11 days	0 days	Tue 10/1/02	Wed 10/30/02

1.7.18.2	Upgrade SBD	Stephen Pordes	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
6	Physicist	100%	66 days	0 days	Tue 10/1/02	Tue 12/31/02
175	Flora R.	50%	33 days	0 days	Tue 10/1/02	Tue 12/31/02

1.7.19	Pbar Tunemeter	CY Tan	\$0.00
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Notes

In Charge
CY Tan

Potential Impact
Important diagnostic for understanding beam-beam effect.

Status
Dismantled for transverse and longitudinal dampers.

Notes
Need to re-consider different techniques for beam excitation e.g., chirp with wavelet analysis, that may allow a reduction in emittance growth.

1.7.19.1	Reassemble tunemeter	CY Tan	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
288	Koch K.	20%	8.8 days	0 days	Thu 5/1/03	Tue 7/1/03
519	Tan C.	50%	22 days	0 days	Thu 5/1/03	Tue 7/1/03

1.7.19.2	Improve measurement technique	CY Tan	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
1	Tevatron Study Shifts	100%	66 days	0 days	Tue 7/1/03	Wed 7/23/03
519	Tan C.	50%	22 days	0 days	Wed 7/2/03	Mon 9/1/03

WBS	Name	Project Manager	Cost
1.8	Recycler	Peter Limon	\$530,000.00
1.8.1	Mechanical Modifications	P. Limon	\$400,000.00
1.8.1.1	Vacuum Upgrade	T. Anderson	\$0.00

Notes

Person in Charge: T. Anderson

Status: Preparations in progress for shutdown work. *[More detailed task definition is contained in D. Augustine's Shutdown Project worklist.]*

Motivation: The major source of beam heating in the Recycler is beam-gas heating. This project is intended to improve the Recycler vacuum by a factor of 3, and thus reduce beam heating.

Uncertainties: Is a 6 week shutdown long enough to complete all the work? Will a factor of 3 improvement in vacuum adequately reduce beam heating so that Recycler equilibrium emittances are small enough for Collider operation?

1.8.1.1.1	Preparation for shutdown work	T. Anderson	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
12	Mechanical Tech.	100%	66 days	0 days	Tue 10/1/02	Tue 12/31/02
27	Anderson J.	30%	19.8 days	0 days	Tue 10/1/02	Tue 12/31/02
157	Dymond W.	100%	66 days	0 days	Tue 10/1/02	Tue 12/31/02
347	McCormick S.	100%	66 days	0 days	Tue 10/1/02	Tue 12/31/02
522	Tennis B.	100%	66 days	0 days	Tue 10/1/02	Tue 12/31/02

Notes

In charge
Terry Anderson

Notes

Between now and the shutdown - prepare ion pumps, and qualify various parts to be installed into the RR vacuum (flying wires, schottky detectors...). The parts themselves are being fabricated in PPD and T.Div. Install and leak check during the shutdown.

1.8.1.1.2	Shutdown work	T. Anderson	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
12	Mechanical Tech.	4,700%	1,551 days	0 days	Wed 1/1/03	Fri 2/14/03
22	Albertus M.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03
55	Beutler A.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03
157	Dymond W.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03
197	Germain Jr. A.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03
208	Gordon T.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03
226	Heinz M.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03
273	Kellett R.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03
315	Lawrence G.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03

WBS	Name	Project Manager	Cost
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"Shutdown work" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
347	McCormick S.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03
383	Muranyi W.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03
387	Nelson J.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03
441	Rauchmiller M.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03
522	Tennis B.	100%	33 days	0 days	Wed 1/1/03	Fri 2/14/03

1.8.1.2	Vacuum experiments	H. Piekarz	\$200,000.00
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Notes
In Charge
Henryk Piekarz

Potential impact
Improvement of pbar lifetime and reduction of beam emittance growth in the Recycler, both possibly by as much as factor 2. For this purpose a windowless transfer lines between Main Injector and Recycler Ring are proposed.

Status
Preliminary analysis of feasibility, designs of two possible differential pumping systems and their cost estimates have been concluded.

Notes
Continue to detail the designs, finalize theoretical investigation of the windowless MI/RR operation (Krish Gounder) and present within a week final proposal(s).
Resources: Two engineers for mechanical analysis and design work, two 2- technicians crews for the differential pumping systems assembly, technician, two engineers and a scientist for a pre-shutdown testing (same as for analysis and design), and two 4(6)- technician crews for the installation in the tunnel. Estimated component cost for two pumping stations \$200k. Also need drafting help for the vacuum vessel and its support design.
Schedule: Final differential pumping station proposal(s) by October 25th. If approved then continue with procurement, assembly work and tests in a pre-shutdown period. Develop the installation plans and testing in the tunnel.

Uncertainties
Not known at present.

1.8.1.2.1	Initial design	H. Piekarz	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
11	Mechanical Engineer	100%	22 days	0 days	Tue 10/1/02	Wed 10/30/02

WBS	Name	Project Manager	Cost
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"Initial design" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
15	Drafter/Designer	50%	11 days	0 days	Tue 10/1/02	Wed 10/30/02
614	Piekarz H.	50%	11 days	0 days	Tue 10/1/02	Wed 10/30/02

1.8.1.2.2	Detailed design, assembly and testing	H. Piekarz	\$200,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
11	Mechanical Engineer	100%	44 days	0 days	Thu 10/31/02	Tue 12/31/02
12	Mechanical Tech.	200%	88 days	0 days	Thu 10/31/02	Tue 12/31/02
15	Drafter/Designer	50%	22 days	0 days	Thu 10/31/02	Tue 12/31/02
614	Piekarz H.	50%	22 days	0 days	Thu 10/31/02	Tue 12/31/02

1.8.1.2.3	Installation	H. Piekarz	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
11	Mechanical Engineer	100%	22 days	0 days	Wed 1/1/03	Thu 1/30/03
12	Mechanical Tech.	200%	44 days	0 days	Wed 1/1/03	Thu 1/30/03
614	Piekarz H.	50%	11 days	0 days	Wed 1/1/03	Thu 1/30/03

1.8.1.3	NuMI Coordination	J. Misek	\$0.00
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Notes
Person in Charge: J. Misek
Status: In progress.
Motivation: The NuMI experiment will require a large amount of MI tunnel time and MI tunnel work in order to be fully ready to take beam by 2005. These tasks require coordination so that different tunnel projects during the shutdown do not interfere with each other.
Uncertainties: None.

1.8.1.3.1	NuMI coordination	J. Misek	\$0.00
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1.8.1.4	Ecool Coordination	J. Leibfritz	\$0.00
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Notes
Person in Charge: J. Leibfritz
Status: In progress
Motivation: Very little Ecool tunnel work will be required during the FY03 shutdown. Nevertheless, shutdown coordination is required.
Uncertainties: None.

1.8.1.4.1	Ecool coordination	J. Leibfritz	\$0.00
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1.8.1.5	MI Modifications	J. Liebfrizt	\$0.00
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Notes
Person in Charge: J.Liebfrizt

WBS	Name	Project Manager	Cost
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"MI Modifications" continued

Notes

Status: Preparations for shutdown work is in progress

Motivation: Improved MI operation.

Uncertainties: None

1.8.1.5.1	MI modifications place holder	J. Liebfritz	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
321	Leibfritz J.	100%	1 day	0 days	Tue 10/1/02	Tue 10/1/02

1.8.1.6	Transfer Line Geometry	A. Marchionni	\$200,000.00
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Notes

Person in Charge: A. Marchionni

Status: Calculations in progress

Motivation: The transverse aperture of the Recycler injection and extraction beamlines is marginally adequate to support Collider operations. Improvements may increase transfer efficiency.

Uncertainties: Shutdown resources may not be available to make any major modifications to these beamlines

1.8.1.6.1	Continuing beam studies to understand issues	A. Marchionni	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	200%	132 days	0 days	Tue 10/1/02	Tue 12/31/02
258	Johnson David E.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
263	Johnstone C.	60%	39.6 days	0 days	Tue 10/1/02	Tue 12/31/02
335	Marchionni A.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
517	Syphers M.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
581	Yang M.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02

1.8.1.6.2	Replace vacuum windows in transfer lines	A. Marchionni	\$200,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
11	Mechanical Engineer	50%	11 days	0 days	Wed 1/1/03	Thu 1/30/03
12	Mechanical Tech.	100%	22 days	0 days	Wed 1/1/03	Thu 1/30/03
335	Marchionni A.	10%	2.2 days	0 days	Wed 1/1/03	Thu 1/30/03

1.8.2	Beams & Studies Coordination	S. Mishra/J. Marriner	\$0.00
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1.8.2.1	FW, IPM, and Schottky calibration	M. Hu	\$0.00
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Notes

Person in Charge: M. Hu

Status: In progress.

Motivation: It is essential to measure the equilibrium transverse emittances in the Recycler with stored, cooled antiprotons.

WBS	Name	Project Manager	Cost
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"FW, IPM, and Schottky calibration " continued

Notes

Uncertainties: Why doesn't Schottky PU work? What is basic flaw of IPM? Beam motion due to MI ramping makes measurements difficult.

1.8.2.1.1	Calibrate Recycler IPM with MI FW using round-trip protons	M. Hu	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	400%	88 days	0 days	Fri 11/1/02	Mon 12/2/02
240	Hu M.	20%	4.4 days	0 days	Fri 11/1/02	Mon 12/2/02

1.8.2.1.2	Continuing studies	M. Hu	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	200%	88 days	0 days	Tue 12/3/02	Fri 1/31/03
240	Hu M.	20%	8.8 days	0 days	Tue 12/3/02	Fri 1/31/03

1.8.2.2	Injection and lattice mismatch studies	A. Marchionni	\$0.00
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Notes

Person in Charge: A. Marchionni

Status: In progress

Motivation: Lattice mismatch leads to emittance blowup. This project attempts to understand and adjust the beamline so that emittance blowup is minimized.

Uncertainties: Results of studies. Transfer losses are not understood.

1.8.2.2.1	Perform One-bump measurements to understand lattice match	A. Marchionni	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	267%	176.22 days	0 days	Tue 10/1/02	Tue 12/31/02
335	Marchionni A.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
581	Yang M.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02

1.8.2.2.2	Coupling studies	A. Marchionni	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	200%	88 days	0 days	Tue 10/1/02	Fri 11/29/02
335	Marchionni A.	20%	8.8 days	0 days	Tue 10/1/02	Fri 11/29/02
581	Yang M.	20%	8.8 days	0 days	Tue 10/1/02	Fri 11/29/02

1.8.2.2.3	Commission beamline BPMs	A. Marchionni	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	400%	88 days	0 days	Fri 11/1/02	Mon 12/2/02
10	Electrical Tech.	80%	17.6 days	0 days	Fri 11/1/02	Mon 12/2/02
335	Marchionni A.	10%	2.2 days	0 days	Fri 11/1/02	Mon 12/2/02

WBS	Name	Project Manager	Cost
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"Commission beamline BPMs" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
434	Prieto P.	30%	6.6 days	0 days	Fri 11/1/02	Mon 12/2/02

1.8.2.3	BPM Studies	B. Choudhary	\$0.00
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Notes

Person in Charge: B. Choudhary

Status: In progress

Motivation: These studies will provide the basis for a specification for the new BPM system

Uncertainties: Results of studies

1.8.2.3.1	Continuing prototyping studies	B. Choudhary	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	500%	220 days	0 days	Tue 10/1/02	Fri 11/29/02
109	Choudhary B.	40%	17.6 days	0 days	Tue 10/1/02	Fri 11/29/02
125	Crisp J.	20%	8.8 days	0 days	Tue 10/1/02	Fri 11/29/02
240	Hu M.	40%	17.6 days	0 days	Tue 10/1/02	Fri 11/29/02
345	McClure C.	20%	8.8 days	0 days	Tue 10/1/02	Fri 11/29/02
359	Meyer T.	20%	8.8 days	0 days	Tue 10/1/02	Fri 11/29/02
434	Prieto P.	70%	30.8 days	0 days	Tue 10/1/02	Fri 11/29/02
545	Voy D.	40%	17.6 days	0 days	Tue 10/1/02	Fri 11/29/02
577	Wu G.	20%	8.8 days	0 days	Tue 10/1/02	Fri 11/29/02

1.8.2.4	Recycler Vacuum Studies	K. Gounder	\$0.00
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1.8.2.4.1	Continuing vacuum studies	K. Gounder	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	400%	264 days	0 days	Tue 10/1/02	Tue 12/31/02
209	Gounder K.	40%	26.4 days	0 days	Tue 10/1/02	Tue 12/31/02

1.8.2.5	Longitudinal Emittance Growth Studies	J. Marriner	\$0.00
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Notes

Person in Charge: J. Marriner

Status: In progress

Motivation: It is essential to minimize longitudinal emittance growth during the complicated Recycler RF emittance calculations. Scientifically sound operational principles are being applied to the Recycler RF manipulations.

Uncertainties: The need for additional hardware is unknown.

WBS	Name	Project Manager	Cost
1.8.2.5.1	Continuing studies	J. Marriner	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	200%	264 days	0 days	Tue 10/1/02	Wed 4/2/03
102	Chase B.	30%	39.6 days	0 days	Tue 10/1/02	Wed 4/2/03
337	Marriner J.	60%	79.2 days	0 days	Tue 10/1/02	Wed 4/2/03
357	Meisner K.	30%	39.6 days	0 days	Tue 10/1/02	Wed 4/2/03

WBS	Name	Project Manager	Cost
1.8.2.6	RF Manipulation Studies	C. Bhat	\$0.00

Notes
Person in Charge: C. Bhat
Status: In progress
Motivation: Similar to 1.8.2.5
Uncertainties: The need for additional hardware is unknown

WBS	Name	Project Manager	Cost
1.8.2.6.1	Continuing studies	C. Bhat	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	200%	264 days	0 days	Tue 10/1/02	Wed 4/2/03
56	Bhat C.	50%	66 days	0 days	Tue 10/1/02	Wed 4/2/03
102	Chase B.	30%	39.6 days	0 days	Tue 10/1/02	Wed 4/2/03
357	Meisner K.	30%	39.6 days	0 days	Tue 10/1/02	Wed 4/2/03

WBS	Name	Project Manager	Cost
1.8.2.7	Measure the Recycler Central Momentum	D. Broemmelsiek	\$0.00

Notes
Person in Charge: D. Broemmelsiek
Status: In progress. Calculations and measurements of 8 GeV transfer requirements have already been made.
Motivation: In order to effectively use the Recycler in Collider operations, the Accumulator → Recycler transfers must take place in less than 10 minutes. This requires that the Recycler, MI, and Accumulator all operate at the same momentum.
Uncertainties: Is there a solution that will allow the MI to be used as a transfer line during Accumulator → Recycler transfers? Will the Accumulator and Debuncher bend buses need to be changed?

WBS	Name	Project Manager	Cost
1.8.2.7.1	Remeasure Recycler, MI, Debuncher and Accumulator central momentum and aperture	D. Broemmelsiek	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	200%	176 days	0 days	Fri 11/1/02	Tue 3/4/03
73	Broemmelsiek D.	40%	35.2 days	0 days	Fri 11/1/02	Tue 3/4/03
193	Gattuso C.	10%	8.8 days	0 days	Fri 11/1/02	Tue 3/4/03
337	Marriner J.	10%	8.8 days	0 days	Fri 11/1/02	Tue 3/4/03

WBS	Name	Project Manager	Cost
1.8.2.7.2	Calculate possible solutions	D. Broemmelsiek	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
73	Broemmelsiek D.	40%	17.6 days	0 days	Wed 3/5/03	Mon 5/5/03
337	Marriner J.	10%	4.4 days	0 days	Wed 3/5/03	Mon 5/5/03

WBS	Name	Project Manager	Cost
1.8.2.8	Ion Clearing Studies	K. Gounder	\$0.00

Notes

Person in Charge: K. Gounder

Status: In progress

Motivation: Trapped ions are likely to be the major source of beam instability in the Recycler ring with large stacks. The stability threshold needs to be determined, and mitigating strategies developed.

Uncertainties: How will this be affected by the Recycler vacuum improvements scheduled for the shutdown?

WBS	Name	Project Manager	Cost
1.8.2.8.1	Develop a study plan	K. Gounder	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
209	Gounder K.	20%	4.4 days	0 days	Mon 2/3/03	Tue 3/4/03

Notes

Jeff (22/10/02): Moved start date from 11/1 to 2/1 to slide the studies after the shutdown.

WBS	Name	Project Manager	Cost
1.8.2.8.2	Studies with large stacks	K. Gounder	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	100%	366 days	0 days	Tue 3/4/03	Fri 7/4/03
3	Recycler Study Shifts	200%	176 days	0 days	Wed 3/5/03	Fri 7/4/03
209	Gounder K.	20%	17.6 days	0 days	Wed 3/5/03	Fri 7/4/03

WBS	Name	Project Manager	Cost
1.8.2.9	Pbar Transfer Efficiency Studies	J. Marriner	\$0.00

Notes

Person in Charge: J. Marriner

Status: In progress

Motivation: Accumulator → Recycler transfer efficiency is currently at 80%. This is required to be at least 90% for effective Recycler operation in the Collider program.

Uncertainties: Results of the studies cannot be predetermined.

WBS	Name	Project Manager	Cost
1.8.2.9.1	Continuing studies with pbar transfers	J. Marriner	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	200%	264 days	0 days	Tue 10/1/02	Wed 4/2/03
73	Broemmelsiek D.	20%	26.4 days	0 days	Tue 10/1/02	Wed 4/2/03
193	Gattuso C.	20%	26.4 days	0 days	Tue 10/1/02	Wed 4/2/03
337	Marriner J.	20%	26.4 days	0 days	Tue 10/1/02	Wed 4/2/03

WBS	Name	Project Manager	Cost
1.8.2.10	Pbar Cooling Studies	R. Pasquinelli	\$0.00

Notes

Person in Charge: R.Pasquinelli

Status: In progress

Motivation: Optimum cooling gain needs to be determined. Equilibrium emittances need to be determined. The cooling systems have been commissioned to first order.

Uncertainties: Instrumentation may not be adequate

1.8.2.10.1	Measure heating and cooling rates with large stacks	R. Pasquinelli	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	133%	731.67 days	0 days	Thu 5/1/03	Fri 10/31/03
3	Recycler Study Shifts	67%	88.44 days	0 days	Thu 5/1/03	Fri 10/31/03
73	Broemmelsiek D.	20%	26.4 days	0 days	Thu 5/1/03	Fri 10/31/03
193	Gattuso C.	10%	13.2 days	0 days	Thu 5/1/03	Fri 10/31/03
413	Pasquinelli R.	10%	13.2 days	0 days	Thu 5/1/03	Fri 10/31/03

Notes

Jeff (10/22/02): Even though this is priority 2 - move this task to after the shutdown. It's a long drawn out task and there aren't enough pbar study shifts.

1.8.2.11	Study of MI Ramp effects	S. Pruss	\$0.00
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Notes

Person in Charge: S. Pruss

Status: In progress

Motivation: Stray fields from the MI ramp modulates the Recycler beam position and tune. This must be minimized in order to reduce longitudinal beam heating and maximize cooling efficiency

Uncertainties: Can the ramped correctors effectively remove MI-induced beam motion in the Recycler? Will ramped quadrupoles be required?

1.8.2.11.1	Continuing studies using new software	S. Pruss	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	667%	440.22 days	0 days	Tue 10/1/02	Tue 12/31/02
435	Pruss S.	80%	52.8 days	0 days	Tue 10/1/02	Tue 12/31/02
577	Wu G.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
581	Yang M.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02

1.8.2.12	General Operational Improvements	S. Mishra	\$0.00
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Notes

Person in Charge: S. Mishra

Status: In progress.

WBS	Name	Project Manager	Cost
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"General Operational Improvements" continued

Notes

Motivation: Effective operation of a high quality storage ring requires perfect operational practices.

Uncertainties: None

1.8.2.12.1	Ongoing operational improvements	S. Mishra	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
366	Mishra C. S.	30%	78 days	0 days	Tue 10/1/02	Mon 9/29/03

1.8.3	Instrumentation & Software	J. Butler	\$130,000.00
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1.8.3.1	Instrumentation	P. Wilson	\$130,000.00
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1.8.3.1.1	New BPM System	B. Choudhary	\$0.00
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Notes

Person in Charge: B. Choudhary

Status: Prototyping in progress

Motivation: The present BPM system does not currently yield reproducible results to the level of accuracy required. The present BPM system does not have adequate sensitivity to 2.5MHz beam.

Uncertainties: Will 600K\$ become available for this project?

1.8.3.1.1.1	Complete prototype design and test	B. Choudhary	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
9	Electrical Engineer	200%	88 days	0 days	Tue 10/1/02	Fri 11/29/02
10	Electrical Tech.	100%	44 days	0 days	Tue 10/1/02	Fri 11/29/02
109	Choudhary B.	20%	8.8 days	0 days	Tue 10/1/02	Fri 11/29/02
125	Crisp J.	50%	22 days	0 days	Tue 10/1/02	Fri 11/29/02
345	McClure C.	20%	8.8 days	0 days	Tue 10/1/02	Fri 11/29/02
359	Meyer T.	50%	22 days	0 days	Tue 10/1/02	Fri 11/29/02
434	Prieto P.	50%	22 days	0 days	Tue 10/1/02	Fri 11/29/02
468	Schappert W.	10%	4.4 days	0 days	Tue 10/1/02	Fri 11/29/02
545	Voy D.	80%	35.2 days	0 days	Tue 10/1/02	Fri 11/29/02
617	Wilson P.	20%	8.8 days	0 days	Tue 10/1/02	Fri 11/29/02

1.8.3.1.1.2	Procure Echotech boards	B. Choudhary	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
125	Crisp J.	20%	2.2 days	0 days	Mon 12/2/02	Mon 12/16/02

1.8.3.1.1.3	Assemble/install signal processing hardware	B. Choudhary	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	Electrical Tech.	400%	176 days	0 days	Thu 4/3/03	Tue 6/3/03

WBS	Name	Project Manager	Cost
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"Assemble/install signal processing hardware" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
109	Choudhary B.	20%	8.8 days	0 days	Thu 4/3/03	Tue 6/3/03
125	Crisp J.	40%	17.6 days	0 days	Thu 4/3/03	Tue 6/3/03
345	McClure C.	40%	17.6 days	0 days	Thu 4/3/03	Tue 6/3/03
434	Prieto P.	40%	17.6 days	0 days	Thu 4/3/03	Tue 6/3/03
617	Wilson P.	20%	8.8 days	0 days	Thu 4/3/03	Tue 6/3/03

1.8.3.1.1.4 Install tunnel hardware and cabling B. Choudhary \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
10	Electrical Tech.	400%	88 days	0 days	Wed 1/1/03	Thu 1/30/03
109	Choudhary B.	20%	4.4 days	0 days	Wed 1/1/03	Thu 1/30/03
125	Crisp J.	40%	8.8 days	0 days	Wed 1/1/03	Thu 1/30/03
345	McClure C.	40%	8.8 days	0 days	Wed 1/1/03	Thu 1/30/03
434	Prieto P.	40%	8.8 days	0 days	Wed 1/1/03	Thu 1/30/03
617	Wilson P.	20%	4.4 days	0 days	Wed 1/1/03	Thu 1/30/03

1.8.3.1.1.5 Commission system B. Choudhary \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	1,000%	440 days	0 days	Wed 6/4/03	Mon 8/4/03
10	Electrical Tech.	200%	88 days	0 days	Wed 6/4/03	Mon 8/4/03
109	Choudhary B.	80%	35.2 days	0 days	Wed 6/4/03	Mon 8/4/03
125	Crisp J.	50%	22 days	0 days	Wed 6/4/03	Mon 8/4/03
345	McClure C.	50%	22 days	0 days	Wed 6/4/03	Mon 8/4/03
359	Meyer T.	50%	22 days	0 days	Wed 6/4/03	Mon 8/4/03
434	Prieto P.	50%	22 days	0 days	Wed 6/4/03	Mon 8/4/03
545	Voy D.	50%	22 days	0 days	Wed 6/4/03	Mon 8/4/03

1.8.3.1.1.6 Modify preamps in tunnel B. Choudhary \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
10	Electrical Tech.	50%	44 days	0 days	Fri 11/1/02	Tue 3/4/03
125	Crisp J.	10%	8.8 days	0 days	Fri 11/1/02	Tue 3/4/03
434	Prieto P.	10%	8.8 days	0 days	Fri 11/1/02	Tue 3/4/03

1.8.3.1.2 IPM Improvements M. Hu \$0.00

Notes

Person in Charge: M. Hu

Status: The present IPM is operational, but not calibrated. In addition, stable, correct operating parameters have not been determined. Studies are in progress

Motivation: The IPM offers a parasitic method of measuring turn-by-turn emittances and is a very valuable diagnostic if it can be made to work

WBS	Name	Project Manager	Cost
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"IPM Improvements" continued

Notes

Uncertainties: Will the hardware require a complete new rebuild?

1.8.3.1.2.1	Calibrate and validate IPM	M. Hu	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	Electrical Tech.	20%	12 days	0 days	Tue 10/1/02	Mon 12/23/02
240	Hu M.	20%	12 days	0 days	Tue 10/1/02	Mon 12/23/02
586	Zagel J.	20%	12 days	0 days	Tue 10/1/02	Mon 12/23/02
617	Wilson P.	10%	6 days	0 days	Tue 10/1/02	Mon 12/23/02

1.8.3.1.2.2	Replace microchannel plate	M. Hu	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	Electrical Tech.	20%	2.2 days	0 days	Wed 1/1/03	Wed 1/15/03
11	Mechanical Engineer	10%	1.1 days	0 days	Wed 1/1/03	Wed 1/15/03
240	Hu M.	10%	1.1 days	0 days	Wed 1/1/03	Wed 1/15/03
586	Zagel J.	10%	1.1 days	0 days	Wed 1/1/03	Wed 1/15/03
617	Wilson P.	10%	1.1 days	0 days	Wed 1/1/03	Wed 1/15/03

1.8.3.1.3	Flying Wires	A. Marchionni	\$40,000.00
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Notes

Person in Charge: A. Marchionni

Status: New FW system is under construction at Technical Division

Motivation: This will provide an additional measurement of transverse emittances in the Recycler, providing a cross check with the Schottky detector and IPM.

Uncertainties: Will this be ready for the January shutdown?

1.8.3.1.3.1	Fabricate FW	A. Marchionni	\$40,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
9	Electrical Engineer	80%	52.8 days	0 days	Tue 10/1/02	Tue 12/31/02
10	Electrical Tech.	80%	52.8 days	0 days	Tue 10/1/02	Tue 12/31/02
12	Mechanical Tech.	100%	66 days	0 days	Tue 10/1/02	Tue 12/31/02
30	Anderson T.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02
335	Marchionni A.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02
396	Nobrega L.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02
617	Wilson P.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
618	Chester N.	40%	26.4 days	0 days	Tue 10/1/02	Tue 12/31/02
619	Lindenmeyer C.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02
620	Pischalnikov Y.	10%	6.6 days	0 days	Tue 10/1/02	Tue 12/31/02

WBS	Name	Project Manager	Cost
1.8.3.1.3.2	Install FW	A. Marchionni	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
9	Electrical Engineer	20%	4.4 days	0 days	Wed 1/1/03	Thu 1/30/03
10	Electrical Tech.	40%	8.8 days	0 days	Wed 1/1/03	Thu 1/30/03
12	Mechanical Tech.	40%	8.8 days	0 days	Wed 1/1/03	Thu 1/30/03
30	Anderson T.	10%	2.2 days	0 days	Wed 1/1/03	Thu 1/30/03
335	Marchionni A.	10%	2.2 days	0 days	Wed 1/1/03	Thu 1/30/03
396	Nobrega L.	10%	2.2 days	0 days	Wed 1/1/03	Thu 1/30/03

1.8.3.1.3.3	Commission FW	A. Marchionni	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	250%	110 days	0 days	Thu 2/27/03	Tue 4/29/03
9	Electrical Engineer	10%	4.4 days	0 days	Thu 2/27/03	Tue 4/29/03
10	Electrical Tech.	10%	4.4 days	0 days	Thu 2/27/03	Tue 4/29/03
335	Marchionni A.	40%	17.6 days	0 days	Thu 2/27/03	Tue 4/29/03

1.8.3.1.4	Commission New BLT	D. Broemmelsiek	\$0.00
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Notes

Person in Charge: D. Broemmelsiek

Status: In progress. Current BLT is sensitive to 53MHz beam. New BLT will be sensitive to 2.5MHz beam.

Motivation: This is required to reduce injection oscillations into the Recycler

Uncertainties: None.

1.8.3.1.4.1	Commission hardware	D. Broemmelsiek	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	400%	176 days	0 days	Fri 11/1/02	Wed 1/1/03
73	Broemmelsiek D.	50%	22 days	0 days	Fri 11/1/02	Wed 1/1/03
468	Schappert W.	10%	4.4 days	0 days	Fri 11/1/02	Wed 1/1/03
577	Wu G.	10%	4.4 days	0 days	Fri 11/1/02	Wed 1/1/03

1.8.3.1.5	New Schottky Detector	R. Pasquinelli	\$20,000.00
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Notes

Person in Charge: R. Pasquinelli

Status: Under fabrication. Will be ready for January shutdown installation.

Motivation: The current Schottky monitor is at low enough frequency that it is sensitive to coherent beam motion. The new Schottky monitor will be at 1.7GHz and will be less sensitive to beam motion.

Uncertainties: None

WBS	Name	Project Manager	Cost
1.8.3.1.5.1	Build detector	R. Pasquinelli	\$20,000.00

ID	Resource Name	Units	Work	Delay	Start	Finish
12	Mechanical Tech.	100%	66 days	0 days	Tue 10/1/02	Tue 12/31/02
130	Cullerton E.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
413	Pasquinelli R.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
479	Seifrid P.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
515	Sun D.	20%	13.2 days	0 days	Tue 10/1/02	Tue 12/31/02
526	Tinsley D.	40%	26.4 days	0 days	Tue 10/1/02	Tue 12/31/02

1.8.3.1.5.2	Install detector	R. Pasquinelli	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
12	Mechanical Tech.	40%	8.8 days	0 days	Wed 1/1/03	Thu 1/30/03
413	Pasquinelli R.	10%	2.2 days	0 days	Wed 1/1/03	Thu 1/30/03
479	Seifrid P.	20%	4.4 days	0 days	Wed 1/1/03	Thu 1/30/03
526	Tinsley D.	20%	4.4 days	0 days	Wed 1/1/03	Thu 1/30/03

1.8.3.1.5.3	Commission detector	R. Pasquinelli	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
2	Pbar Study Shifts	400%	376.5 days	0 days	Thu 3/13/03	Mon 4/14/03
3	Recycler Study Shifts	200%	44 days	0 days	Fri 3/14/03	Mon 4/14/03
73	Broemmelsiek D.	20%	4.4 days	0 days	Fri 3/14/03	Mon 4/14/03
413	Pasquinelli R.	10%	2.2 days	0 days	Fri 3/14/03	Mon 4/14/03

1.8.3.1.6	Injection Dampers	G.W. Foster	\$70,000.00
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Notes

Person in Charge: G.W.Foster

Status: In progress. Being developed in parallel with MI dampers

Motivation: Fast transfers will preclude the lengthy reverse proton tuneup now used to prepare for pbar transfers. Injection dampers will be required to reduce injection oscillations to an acceptable level.

1.8.3.1.6.1	Develop FPGA firmware	G.W. Foster	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
8	Computer Professional	80%	70.4 days	0 days	Tue 10/1/02	Thu 1/30/03
613	Foster G. W.	10%	8.8 days	0 days	Tue 10/1/02	Thu 1/30/03

1.8.3.1.6.2	Fabrication of striplines	G.W. Foster	\$50,000.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
11	Mechanical Engineer	50%	22 days	0 days	Fri 11/1/02	Wed 1/1/03
12	Mechanical Tech.	100%	44 days	0 days	Fri 11/1/02	Wed 1/1/03
613	Foster G. W.	10%	4.4 days	0 days	Fri 11/1/02	Wed 1/1/03

WBS	Name	Project Manager	Cost
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1.8.3.1.6.3 Installation of striplines G.W. Foster \$20,000.00

ID	Resource Name	Units	Work	Delay	Start	Finish
9	Electrical Engineer	20%	2.2 days	0 days	Thu 1/2/03	Thu 1/16/03
10	Electrical Tech.	40%	4.4 days	0 days	Thu 1/2/03	Thu 1/16/03
11	Mechanical Engineer	25%	2.75 days	0 days	Thu 1/2/03	Thu 1/16/03
12	Mechanical Tech.	100%	11 days	0 days	Thu 1/2/03	Thu 1/16/03
613	Foster G. W.	10%	1.1 days	0 days	Thu 1/2/03	Thu 1/16/03

1.8.3.1.6.4 Commission system G.W. Foster \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	200%	88 days	0 days	Fri 1/17/03	Wed 3/19/03
613	Foster G. W.	40%	17.6 days	0 days	Fri 1/17/03	Wed 3/19/03

1.8.3.2 Software D. Petravick \$0.00

1.8.3.2.1 BPM Software B. Choudhary \$0.00

Notes

Person in Charge: B. Choudhary

Status: Under development

Motivation: The new BPM system will require all new front-end software, and some new application programming

Uncertainties: None

1.8.3.2.1.1 Specify front-end software B. Choudhary \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
109	Choudhary B.	40%	8.8 days	0 days	Tue 10/1/02	Wed 10/30/02
545	Voy D.	20%	4.4 days	0 days	Tue 10/1/02	Wed 10/30/02

1.8.3.2.1.2 Write front-end software B. Choudhary \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
109	Choudhary B.	10%	8.8 days	0 days	Mon 12/2/02	Wed 4/2/03
545	Voy D.	100%	88 days	0 days	Mon 12/2/02	Wed 4/2/03

1.8.3.2.1.3 Commission front-end software B. Choudhary \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	500%	220 days	0 days	Wed 6/4/03	Mon 8/4/03
8	Computer Professional	20%	8.8 days	0 days	Wed 6/4/03	Mon 8/4/03

1.8.3.2.2 IPM Software M. Hu \$0.00

Notes

Person in Charge: M. Hu

Status: In progress

WBS	Name	Project Manager	Cost
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"IPM Software" continued

Notes

Motivation: Current IPM software is "expert-only" interface running on a Mac. A standard application interface is required.

Uncertainties: None

1.8.3.2.2.1	Specify software	M. Hu	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
8	Computer Professional	10%	4.4 days	0 days	Tue 10/1/02	Fri 11/29/02
240	Hu M.	10%	4.4 days	0 days	Tue 10/1/02	Fri 11/29/02

1.8.3.2.2.2	Write software	M. Hu	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
8	Computer Professional	80%	70.4 days	0 days	Mon 12/2/02	Wed 4/2/03
240	Hu M.	10%	8.8 days	0 days	Mon 12/2/02	Wed 4/2/03
615	Petravik D.	10%	8.8 days	0 days	Mon 12/2/02	Wed 4/2/03

1.8.3.2.2.3	Commission software	M. Hu	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	400%	88 days	0 days	Thu 4/3/03	Fri 5/2/03
8	Computer Professional	10%	2.2 days	0 days	Thu 4/3/03	Fri 5/2/03
240	Hu M.	40%	8.8 days	0 days	Thu 4/3/03	Fri 5/2/03

1.8.3.2.3	Flying Wire Software	A. Marchionni	\$0.00
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Notes

Person in Charge: A. Marchionni

Status: In progress

Motivation: New flying wires will require new software.

Uncertainties: None

1.8.3.2.3.1	Specify software	A. Marchionni	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
8	Computer Professional	10%	2.2 days	0 days	Tue 10/1/02	Wed 10/30/02
335	Marchionni A.	10%	2.2 days	0 days	Tue 10/1/02	Wed 10/30/02

1.8.3.2.3.2	Write software	A. Marchionni	\$0.00
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ID	Resource Name	Units	Work	Delay	Start	Finish
8	Computer Professional	80%	70.4 days	0 days	Thu 10/31/02	Mon 3/3/03
335	Marchionni A.	10%	8.8 days	0 days	Thu 10/31/02	Mon 3/3/03
615	Petravik D.	10%	8.8 days	0 days	Thu 10/31/02	Mon 3/3/03

WBS	Name	Project Manager	Cost
1.8.3.2.3.3	Commission software	A. Marchionni	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	200%	88 days	0 days	Tue 3/4/03	Fri 5/2/03
8	Computer Professional	20%	8.8 days	0 days	Tue 3/4/03	Fri 5/2/03
335	Marchionni A.	40%	17.6 days	0 days	Tue 3/4/03	Fri 5/2/03

WBS	Name	Project Manager	Cost
1.8.3.2.4	Multiwire Software	M. Yang	\$0.00
	<u>Notes</u>		
	<u>Person in Charge:</u> M. Yang		
	<u>Status:</u> In progress		
	<u>Motivation:</u> New multiwires will require new software.		
	<u>Uncertainties:</u>		

WBS	Name	Project Manager	Cost
1.8.3.2.4.1	Commission software	M. Yang	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	200%	44 days	0 days	Fri 11/1/02	Mon 12/2/02
8	Computer Professional	10%	2.2 days	0 days	Fri 11/1/02	Mon 12/2/02
581	Yang M.	20%	4.4 days	0 days	Fri 11/1/02	Mon 12/2/02

WBS	Name	Project Manager	Cost
1.8.3.2.5	BLT Software	D. Broemmelsiek	\$0.00
	<u>Notes</u>		
	<u>Person in Charge:</u> D. Broemmelsiek		
	<u>Status:</u> In progress		
	<u>Motivation:</u> New BLT will require new software.		
	<u>Uncertainties:</u> None		

WBS	Name	Project Manager	Cost
1.8.3.2.5.1	Write front-end software	D. Broemmelsiek	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
73	Broemmelsiek D.	10%	4.4 days	0 days	Tue 10/1/02	Fri 11/29/02
468	Schappert W.	80%	35.2 days	0 days	Tue 10/1/02	Fri 11/29/02

WBS	Name	Project Manager	Cost
1.8.3.2.5.2	Modify application software	D. Broemmelsiek	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
73	Broemmelsiek D.	10%	2.2 days	0 days	Mon 12/2/02	Tue 12/31/02
577	Wu G.	80%	17.6 days	0 days	Mon 12/2/02	Tue 12/31/02
615	Petravik D.	10%	2.2 days	0 days	Mon 12/2/02	Tue 12/31/02

WBS	Name	Project Manager	Cost
1.8.3.2.5.3	Commission application software	D. Broemmelsiek	\$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
73	Broemmelsiek D.	20%	8.8 days	0 days	Thu 1/2/03	Tue 3/4/03

WBS	Name	Project Manager	Cost
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"Commission application software" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
577	Wu G.	10%	4.4 days	0 days	Thu 1/2/03	Tue 3/4/03

1.8.3.2.6 Schottky Detector Software **D. Broemmelsiek** **\$0.00**

Notes

Person in Charge: D. Broemmelsiek

Status: In progress

Motivation: New Schottky detector will require new software.

Uncertainties: None.

1.8.3.2.6.1 Specify software D. Broemmelsiek \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
8	Computer Professional	10%	4.4 days	0 days	Tue 10/1/02	Fri 11/29/02
73	Broemmelsiek D.	10%	4.4 days	0 days	Tue 10/1/02	Fri 11/29/02

1.8.3.2.6.2 Write OAC software D. Broemmelsiek \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
8	Computer Professional	80%	70.4 days	0 days	Mon 12/2/02	Wed 4/2/03
73	Broemmelsiek D.	10%	8.8 days	0 days	Mon 12/2/02	Wed 4/2/03
615	Petravik D.	10%	8.8 days	0 days	Mon 12/2/02	Wed 4/2/03

1.8.3.2.6.3 Commission software D. Broemmelsiek \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
3	Recycler Study Shifts	200%	44 days	0 days	Thu 4/3/03	Fri 5/2/03
8	Computer Professional	10%	2.2 days	0 days	Thu 4/3/03	Fri 5/2/03
73	Broemmelsiek D.	40%	8.8 days	0 days	Thu 4/3/03	Fri 5/2/03

1.8.3.2.7 Injection Damper Software **G.W. Foster** **\$0.00**

Notes

Person in Charge: G.W. Foster

Status: In progress

Motivation: New injection dampers will require front-end software

Uncertainties: None

1.8.3.2.7.1 Specify graphics interface G.W. Foster \$0.00

ID	Resource Name	Units	Work	Delay	Start	Finish
8	Computer Professional	10%	2.2 days	0 days	Fri 11/1/02	Mon 12/2/02
613	Foster G. W.	10%	2.2 days	0 days	Fri 11/1/02	Mon 12/2/02

WBS	Name	Project Manager	Cost																																		
1.8.3.2.7.2	Write software	G.W. Foster	\$0.00																																		
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1.8.3.2.7.3	Commission software	G.W. Foster	\$0.00																																		
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613	Foster G. W.	20%	4.4 days	0 days	Wed 3/5/03	Thu 4/3/03																															
1.8.3.2.8	Pbar Extraction Software	C. Bhat	\$0.00																																		
	<p><u>Notes</u></p> <p><u>Person in Charge:</u> C. Bhat</p> <p><u>Status:</u> In progress</p> <p><u>Motivation:</u> Pbar extraction from the Recycler involves complicated RF manipulations. This requires application programming to calculate the correct RF parameters.</p> <p><u>Uncertainties:</u> None</p>																																				
1.8.3.2.8.1	Specify software	C. Bhat	\$0.00																																		
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1.8.3.2.8.3	Commission software	C. Bhat	\$0.00																																		
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WBS	Name	Project Manager	Cost																																			
1.8.3.2.9	Correction Element Control	G. Wu	\$0.00																																			
	<u>Notes</u>																																					
	<u>Person in Charge:</u> G.Wu																																					
	<u>Status:</u> In progress; all Recycler correction dipoles have ramp capability																																					
	<u>Motivation:</u> MI ramp disturbs the Recycler beam orbit. This blows up the beam longitudinally; limits the transverse aperture, and makes emittance measurements and cooling measurements difficult																																					
	<u>Uncertainties:</u> Will tune trombone require ramping?																																					
1.8.3.2.9.1	Specify software	G. Wu	\$0.00																																			
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ID	Resource Name	Units	Work	Delay	Start	Finish																																
5	Booster Study Shifts	400%	176 days	0 days	Mon 12/2/02	Thu 1/30/03																																
435	Pruss S.	10%	4.4 days	0 days	Mon 12/2/02	Thu 1/30/03																																
577	Wu G.	50%	22 days	0 days	Mon 12/2/02	Thu 1/30/03																																
581	Yang M.	10%	4.4 days	0 days	Mon 12/2/02	Thu 1/30/03																																
1.8.3.2.10	Emittance Measurement Software	K. Gounder	\$0.00																																			
	<u>Notes</u>																																					
	<u>Person in Charge:</u> K. Gounder																																					
	<u>Status:</u> In progress																																					
	<u>Motivation:</u> Emittance measurements and datalogging can be done using standard tools like the Lumberjack datalogger or Fast Time Plot package. More sophisticated data monitoring might be useful.																																					
	<u>Uncertainties:</u> None																																					
1.8.3.2.10.1	Specify software	K. Gounder	\$0.00																																			
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Work</th> <th>Delay</th> <th>Start</th> <th>Finish</th> </tr> </thead> <tbody> <tr> <td>8</td> <td>Computer Professional</td> <td>10%</td> <td>2.2 days</td> <td>0 days</td> <td>Wed 1/1/03</td> <td>Thu 1/30/03</td> </tr> <tr> <td>209</td> <td>Gounder K.</td> <td>10%</td> <td>2.2 days</td> <td>0 days</td> <td>Wed 1/1/03</td> <td>Thu 1/30/03</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	8	Computer Professional	10%	2.2 days	0 days	Wed 1/1/03	Thu 1/30/03	209	Gounder K.	10%	2.2 days	0 days	Wed 1/1/03	Thu 1/30/03																
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209	Gounder K.	10%	2.2 days	0 days	Wed 1/1/03	Thu 1/30/03																																

WBS	Name	Project Manager	Cost																																		
1.8.3.2.10.2	Write software	K. Gounder	\$0.00																																		
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615	Petravik D.	10%	2.2 days	0 days	Fri 1/31/03	Mon 3/3/03																															
1.8.3.2.10.3	Commission software	K. Gounder	\$0.00																																		
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209	Gounder K.	40%	8.8 days	0 days	Tue 3/4/03	Wed 4/2/03																															
1.8.3.2.11	Database Entry	C. Gattuso	\$0.00																																		
	<u>Notes</u> <u>Person in Charge:</u> C. Gattuso <u>Status:</u> In progress <u>Motivation:</u> Almost all hardware and software upgrades require database entries. <u>Uncertainties:</u> None																																				
1.8.3.2.11.1	Ongoing database entry	C. Gattuso	\$0.00																																		
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Work</th> <th>Delay</th> <th>Start</th> <th>Finish</th> </tr> </thead> <tbody> <tr> <td>193</td> <td>Gattuso C.</td> <td>10%</td> <td>26 days</td> <td>0 days</td> <td>Tue 10/1/02</td> <td>Mon 9/29/03</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	193	Gattuso C.	10%	26 days	0 days	Tue 10/1/02	Mon 9/29/03																						
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1.8.4	Stochastic Cooling	R. Pasquinelli	\$0.00																																		
1.8.4.1	Stochastic Cooling Optimization	R. Pasquinelli	\$0.00																																		
	<u>Notes</u> <u>Person in Charge:</u> R. Pasquinelli <u>Status:</u> In progress. Transverse system hardware is optimized. 1-2GHz momentum hardware requires additional filter. <u>Motivation:</u> Cooling rates must be optimized for best Recycler performance. <u>Uncertainties:</u> Further hardware improvements may be required.																																				
1.8.4.1.1	Build and install new 1-2GHz momentum filter	R. Pasquinelli	\$0.00																																		
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WBS	Name	Project Manager	Cost																																			
1.8.4.1.2	Commission new 1-2GHz momentum filter	R. Pasquinelli	\$0.00																																			
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1.8.4.1.3	Optimize all cooling systems at large stack sizes after vacuum upgrade	R. Pasquinelli	\$0.00																																			
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1.9	Daily Operations & Maintenance		\$0.00																																			
1.9.1	Perform daily operations & maintenance work		\$0.00																																			
1.10	Shutdown		\$0.00																																			
1.10.1	Perform Shutdown work		\$0.00																																			
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2	NuMI					\$0.00																																
3	MiniBooNE					\$0.00																																
4	SY120					\$0.00																																
5	E-cooling					\$0.00																																
6	Run IIb					\$0.00																																
7	A0 Photoinjector					\$0.00																																
8	Muon Cooling					\$0.00																																
9	Linear Collider					\$0.00																																
10	LHC					\$0.00																																
11	VLHC					\$0.00																																
12	Other					\$0.00																																